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Immigration—or Machinery?

By K. H. CONDIT
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Labor shortage will become more serious in the near future—A restrictive immigration policy favored by majority—Increased production per man through better machinery the only answer

THE RISING TIDE of industrial prosperity has brought in with it the inevitable demand for more labor. Unemployment, a serious problem twelve months ago, has practically ceased to exist, and in its place has come a definite labor shortage, more pronounced in some localities than in others, but constantly growing in amount for the country as a whole. Although the shortage is more serious in some crafts than in others, it is becoming general throughout all branches of skilled and unskilled labor.

In starting an investigation of the labor shortage, the first thought that naturally occurs is, if it took only twelve months to pass from a period of acute unemployment to one of serious shortage, how long will it take for the present upward wave of business to exhaust itself and bring the country back to another period of depression? The question cannot be answered definitely, of course, because of such unknown factors as the outcome of the invasion of the Ruhr Valley. The best economic thought of the country, as expressed in our leading statistical services, believes that the present upswing will continue at least until July, 1923, and probably until the first of 1924. After that time opinions differ, some holding that the business curve will continue on a slightly ascending scale for perhaps two years more, while others believe that a depression is due to begin not later than January 1. It seems evident, then, that the labor shortage will get worse for at least six months, and probably longer, and may be a serious problem for three years before the turn of the business cycle alleviates it. Where are we going to get the labor to keep our industries moving forward?

Before attempting to find the answer to the last question we must realize that it divides itself into two distinct parts, the answers to which may be the same, or may not. We must look not only for the answer to the pressing problem of the immediate present, but must decide how we are going to answer it for the next fifty or one hundred years. In seeking for the solution of his own private problems, the individual manufacturer can get valuable enlightenment from the recently published report on the immigration problem based on an investigation conducted by the National Industrial Conference Board of New York. The economists, statisticians and sociologists of this board, acting under the direction of Magnus W. Alexander, have conducted a disinterested and painstaking research of the whole immigration problem of the United States since records were made. They have reported without bias the facts as they have found them, and have not diminished the value of their work by recommending any legislative or other panaceas to give immediate and sure relief.

The first vital fact that we get from the Industrial Conference Board is that the birth rate in the United

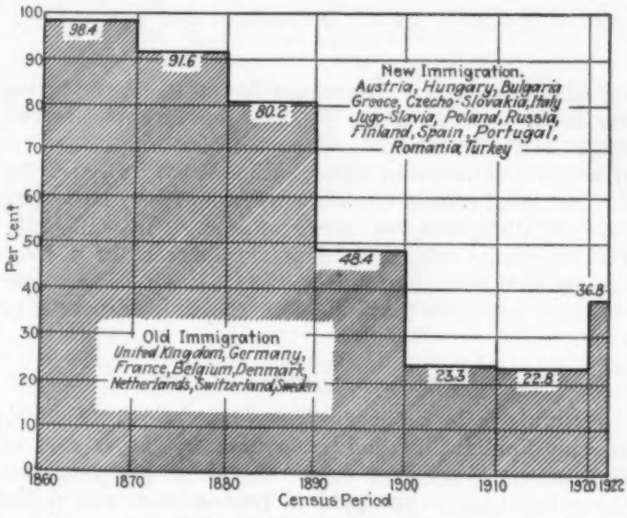


FIG. 1—RELATIVE PROPORTIONS OF NEW AND OLD IMMIGRATION GROUPS

States is not sufficiently high to produce workers fast enough to supply the growing demand of American industries. As there is small likelihood that the birth rate will increase, but two alternatives present themselves. Either we must open our doors to workers from other lands, in other words, stimulate immigration, or we must find some means of increasing the individual output of every available worker here.

Assuming for the moment that the manufacturer must depend upon immigration for his additional labor supply, let us see where we stand as regards the immediate present. The law under which immigrants are at present entering the United States limits the number com-

ing from a given country in any calendar year to three per cent of the foreign born members of that race living in the United States at the time of the 1910 Census. Another provision of the law limits the number entering in any one month to twenty per cent of the quota for the year. The supporters of the three per cent limit law had in mind not only the general limitation of immigration, but the reduction of the percentage of southern European immigrants and the increase of the percentage of immigrants from northwestern Europe in the number let in in any given period. The relative percentage of northern and southern immigrants prior to the passage of the present law and the effect of the present law on these percentages are shown in Fig. 1.

The effect of the new law in limiting the total number of immigrants is illustrated by the fact that during the fiscal year of 1920, 805,228 immigrants arrived, while 247,718 emigrants departed, leaving a net increase of population by immigration of 557,510. During the first fiscal year of the law's operation, the year ending June 30, 1922, 309,556 immigrants came in while 198,712 emigrants left, making a net increase of population by immigration of only 110,844. It will be seen that the gain was less than one-fifth that of the preceding year.

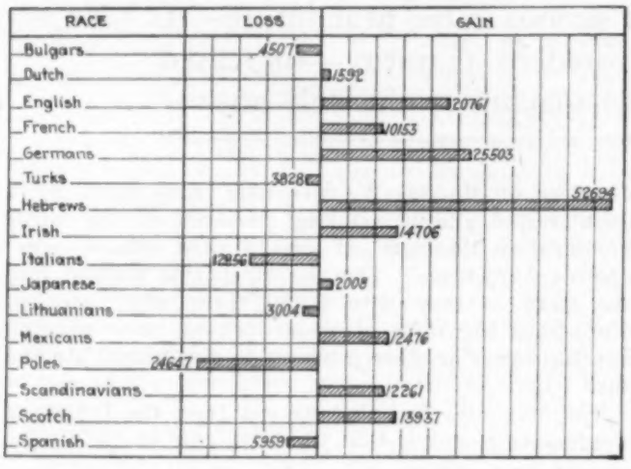


FIG. 2—DIAGRAM SHOWING IMMIGRATION FOR FISCAL YEAR 1922

Net Loss in Common Labor

But this is by no means the whole story. Analysis of the immigrants and emigrants by profession or occupation shows that under the three per cent law, there has been a net gain in professional and skilled labor classes and a large net loss in the common labor class. In other words, instead of gaining common laborers through immigration, we are actually losing more than we gain because of the return of men of this class, mostly Italians and Poles, to their native countries.

Various attempts have been made to soften the restrictions of the three per cent law by amendment, but without success. Organized labor is, of course, strongly in favor of drastic restrictions for more or less selfish reasons. But, in addition, there are many disinterested citizens who believe that the sociological problems connected with the arrival of many thousands of unassimilable immigrants are far more dangerous to the country as a whole than the economic hardship caused by an insufficient labor supply. It is almost inconceivable that any change in the three per cent law can take effect before the end of the next fiscal year, which ends June 30, 1924, as the last Congress expired March 4, without taking action, and the President is strongly against calling a special session.

For the present, then, the manufacturer has no recourse but to turn to the other alternative already mentioned, the increasing of the individual output of the men available. This factor also divides itself into two parts, better management and better equipment. Much can probably be done by improving methods of management. In the series of articles, "What's Wrong With the Railroad Shops?" it was brought out that in very few cases were either men or machines producing anywhere near their capacity, and what was said of railroad shops in this respect applies with equal force to many other shops.

More and Better Machinery Necessary

While better management may do much to help ease the present situation, it cannot go the whole way and more and better machinery must be relied upon to do the rest. There are in this country many ingenious machines that do the work of many men, but their number must be multiplied if our industries are not to suffer. We must apply the kind of brains that produce the big lake ore carriers, which load and unload themselves by means of elevators and conveyors in periods of a few hours, to some of our other problems. It is said that the crops of 1922 were the largest ever produced in the United States, and that the relative number of men engaged in harvesting them was the smallest on record. Apparently, the farmer is learning by dire necessity the value of agricultural machinery for doing the heavy work of the farm. Some of our manufacturers might profit from a study of the way the farmer has replaced unskilled labor with machinery.

Let's forget our present problems for the moment and take a look at the future. The extension of the three per cent limit act expires June 30, 1924, and, consequently, a new immigration law must be passed before that time. Judging from the immigration legislation which the House Immigration Committee attempted to have the expiring Congress pass, our policy of restricting the number of aliens coming to our shores is not likely to suffer any radical change.

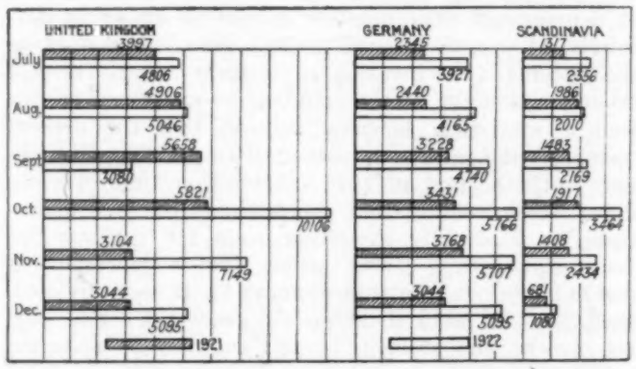


FIG. 3—DIAGRAM SHOWING INCREASE IN IMMIGRATION FROM NORDIC COUNTRIES IN 1922 OVER 1921

There are good reasons for believing that immigration restriction will be a permanent policy. The objection of the American Federation of Labor is sure to continue, because it is founded on the very real fear of its members that the competition of cheap alien labor will reduce the standard of living of the American

working man. That this fear is a reasonable one is shown by a recent survey of housing conditions where it was found that the average rental paid by the immigrant family was appreciably less than that paid by the American working man with a family, and that the immigrants were content to squeeze more people into a room than were the Americans. Another factor that should be taken into consideration is the effect of the ignorance of the immigrant of the language and customs in his new home, on labor conditions in the factories and plants where he works. Unscrupulous foremen exact tribute from him for increases in pay, better jobs and retention in times of unemployment. The bad effect of this practice on the plant morale is obvious.

The Feeling Against Immigration

The membership of the American Federation of Labor, however, is entirely too small to account for the force that lies behind the immigration restriction idea. Always excepting the employers who need a steady flow of cheap labor to operate their plants and expand them to keep up with the industrial growth of the nation, there is an almost universal feeling against unlimited immigration. This feeling may readily be explained by the fact that a great majority of the people already here belong to a different race from that to which the majority of our immigrants, under the unlimited restriction prior to the enactment of the present law, belong. The new boy on the block is always looked upon with suspicion by the old gang.

There is also a pretty general feeling that the proportion of illiteracy, insanity, pauperism and crime is greater among the recent arrivals than among the native. As a matter of fact, statistics show this criticism to be unjust. The balance swings the other way. The percentage of illiteracy, it is true, was much greater until the present law went into effect, but the percentages of insanity and pauperism are lower and the list of crimes committed include far more of the less serious offences which are probably due to ignorance of the law rather than intent.

Another criticism aimed against the immigrant is that he sends most of his earnings back home. It is quite natural that he should, and it is certainly not an unmitigated evil for certain European countries find in the money sent back by their emigrant sons the only means of balancing their budgets.

On the other hand, there are some things to be said in favor of the immigrant. His principal object in coming here is to work. Rather more than half of the recent immigrants are males between the ages of 16 and 64. The great number who come here without families are not tied to any one part of the country and consequently add to the fluidity of the labor supply. They, therefore, aid to a certain extent in solving the unemployment problem, because when jobs become scarce in one locality, they can easily move to another where a different situation exists.

There is a sentiment in some quarters to change the basis upon which the three per cent limit is calculated from gross to net immigration. That this would have a profound effect upon the character of our immigration is clear from the emigration figures, which, as already mentioned, show a great number of the common labor class going home each year.

Such a change would undoubtedly add to the supply of common labor, but it would also tend to develop a peon class of migratory labor most undesirable from the social and political point of view. Such labor would flow to this country when work was plentiful, and flow back during hard times. It would come here with no intention of remaining or of adapting itself to our methods and adding to our national wealth. It would live in labor camps and would be practically untouched by any of our various Americanization and betterment projects. Worst of all, it would probably be exploited to an extent hitherto undreamed of, and the consequences might be extremely dangerous.

Another plan, and a promising one, would retain the present three per cent limitation but would permit an additional two per cent chosen on a selective basis to come in. One of the bases of selection would be a demonstrated need for immigrants of a particular kind. They might be farm laborers, or men for railway maintenance or for steel mills, and they would have to meet physical, mental and moral tests. This plan would add a certain amount of flexibility to the present one and would afford a test of the possibilities of selection.

An ideal immigration law so drawn as to carry out an enlightened immigration policy, when we develop one, would supply sufficient high-grade workers for the needs of industry and at the same time would not add to our sociological and political problems. Selective examination before the prospective immigrant was permitted to board ship for the United States would be an intrinsic part of such a policy.

Making the Best of What We Have

As political considerations and organized self-interest are sure to play a big part in our immigration legislation for some years to come, it will probably be quite a while before we get our ideal immigration bill. Until that time comes we shall have a condition rather than a theory to face and must work out our own salvation. Fig. 2 shows how the kind of restrictive immigration we now have, and are likely to have in the immediate future, results. It will be noted that there is a net loss of Poles, Italians, Greeks and Bulgarians, the nationalities which supply our rough labor. On the other hand, there is a net gain of English, French, Germans, Scotch and Scandinavians, people who are not willing to do "bull" work, but who have the intelligence to operate machinery of considerable complication.

In Fig. 3 the fact is brought out that the people from northwestern Europe came over during the last few months of 1922 at almost double the rate at which they came during the same period in 1921. The increase is due, of course, to the business revival of the United States, and it seems possible that it may lead to some of these countries filling their immigration quotas, an achievement which seemed hardly possible less than a year ago.

Here, then, is the situation: The industries of the United States are certain to be faced with a shortage in the supply of common labor. On the other hand, there promises to be an adequate supply of workers who go into the skilled and semi-skilled crafts. It is obvious that if this country is to continue to expand industrially, means must be found for doing by machinery the work done in the past by unskilled labor. The men to operate the machines are at hand and the capital to purchase them will be found when it is needed. It remains for the designers to conceive and the builders to construct the machinery to do the work of industry. A great duty and a great opportunity lie before them. If they fulfill the one, the other cannot escape them.

Operations in Making Steam Shovels

By FRED H. COLVIN
Editor, *American Machinist*

The first article — A star-feed facing tool — Turning taper rolls — Special planing, drilling and milling fixtures—An awkward planing job

THOSE who are not initiated in the mysteries of building steam shovels would not think of them as having much gearing hidden away in their interior make-up, but a glimpse at the stock room of the Marion Steam Shovel Co., Marion, Ohio, Fig. 1, shows what a part gears really play in this sort of work. Worm, bevel and spur gears abound in great variety. Consequently gear cutting machinery plays an important part in the shop equipment, a corner of the gear department being shown in Fig. 2. This equipment includes both machines using formed gear cutters and machines of the hobbing type, as shown in the foreground. These machines are all served with jib cranes conveniently placed as well as with the usual overhead traveling cranes.

FIG. 1—SOME OF THE GEARS USED IN STEAM SHOVEL CONSTRUCTION.

FIG. 2—A CORNER OF THE GEAR CUTTING DEPARTMENT

A rather unusual planing job, facing the bosses and jaws of a truck frame for a large shovel, is shown in Fig. 3. These pieces are awkward to hold and require blocking up at the ends as well as tying down at the centers by means of short bars slipped through the lower holes. End stops with turnbuckles and the use of long tool shanks enable the work to be handled on the Dietrick & Harvey open-side planer as shown.

Turning and facing the large bevel ring shown in Fig. 4 brings into play the star feed facing tool *A*, held in the tool bar of a large Niles boring mill. The stud *B*, fastened to the boring mill table, strikes the star wheel at each revolution and feeds the tool across the face of the bevel ring.

The taper rolls which fit the bevel ring just shown, are turned from solid blanks on the Bullard vertical

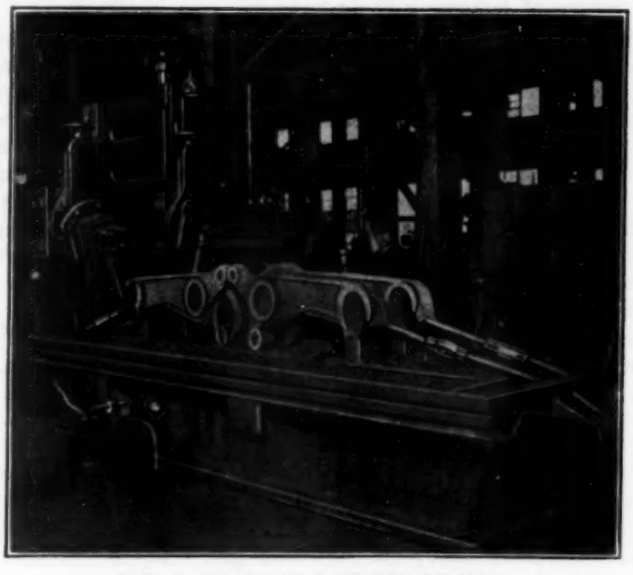


FIG. 3—PLANING A TRUCK FRAME

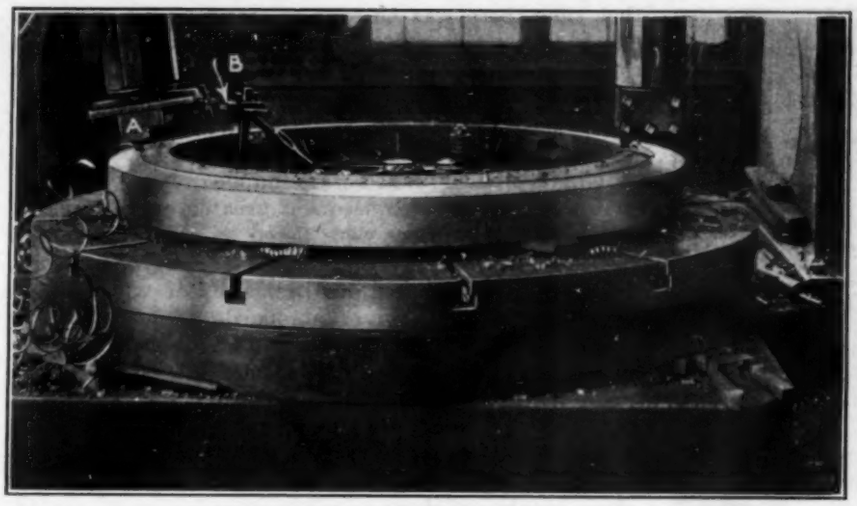


FIG. 4—STAR FEED TAPER FACING TOOL

lathe illustrated in Figs. 5 and 6. The first operation is to bore and face the blank and bevel the edge, so that it looks like Fig. 5. Then a husky air drill is brought into play and with the roller still chucked in the machine, the air drill is held in position so as to drill a good sized hole near the edge. This hole does not go through the blank but only deep enough to act as a dowel for driving the roll while the taper is being turned in the next operation.

The roll then goes to another Bullard machine and is turned over so that the hole fits over a driving stud on the fixture *A*, Fig. 6, a bolt through the center locating the roll and holding it in position for the taper turning. The taper is secured by setting the turret slide to the proper angle and using an offset tool holder. The chips

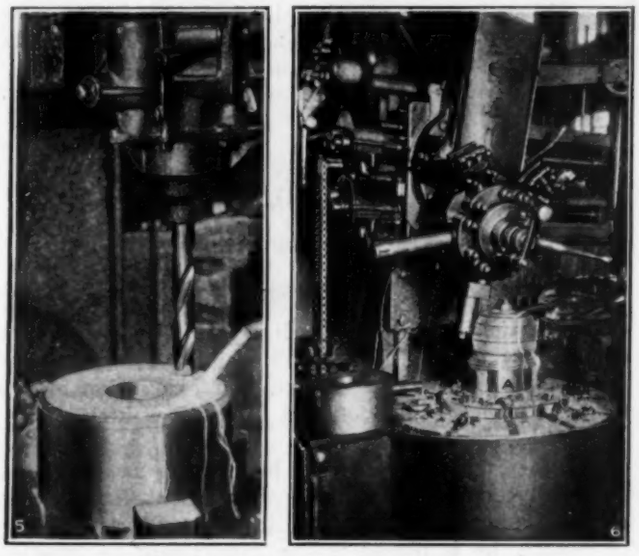


FIG. 5—DRILLING STUD HOLE IN ROLLER. FIG. 6—TURNING THE TAPER ROLLER

to be seen on the table give some idea of the size of cut which can be taken on this work.

A special fixture for drilling holes in both ends of two pins at once is shown in Fig. 7. The pins are used in the roller track with which some shovels are provided, and have to be drilled in fairly large quantities. The drilling head shown is used in a large radial drilling machine and handles the work rapidly. Each drill has a jet of cooling compound playing directly on it.

Strings of iron boxes are planed on a Gray planer, Fig. 8, using special fixtures for this purpose. In order to bring the work near the edge of the table so as to avoid overhang of the side-head tools, special bases were made as at *A* and *B*. The T-slot in the table is so far from the edge that the fixture base has an offset at the bottom, allowing the T-slot of the fixture to be placed as near the edge as desired and avoiding the tool overhang. The boxes are held by straps and central bolts as shown.

In Fig. 9 is a fixture for milling four rod brasses at one setting. The interesting feature of the fixture is that the studs on which the brasses are held are so designed as to hold the brasses in any one of four positions and locate them properly in regard to the cutter. The second brass, it will be noticed, has an angle at the bottom. The stud which holds this brass is provided with an index so that when the angular side is rolled up, the brass is held at the proper angle for the cut.

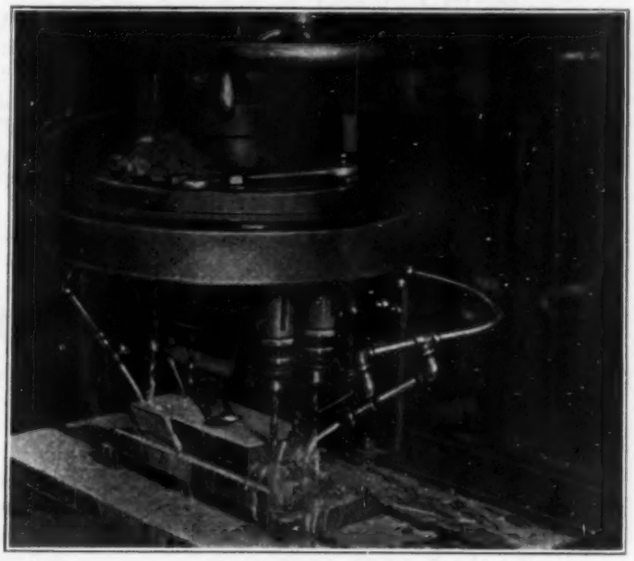


FIG. 7—DRILLING FOUR HOLES IN TWO PINS

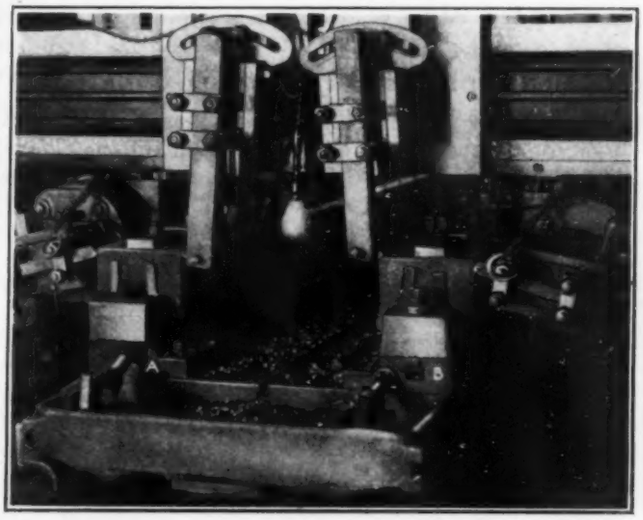


FIG. 8—OFFSETTING T-SLOTS FOR PLANING FIXTURE

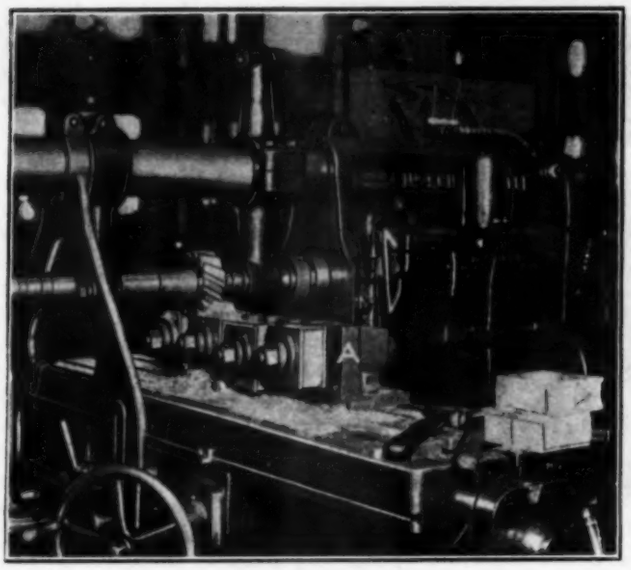


FIG. 9—MILLING FIXTURE FOR ROD BRASSES

Details of this fixture are shown in Fig. 10. The main casting *A*, in both Figs. 9 and 10, is supported by the table and is positioned by a T-slot. It has four recesses for holding the rod brasses in position as at *B*, *C*, *D* and *E*. Three of the recesses are square with

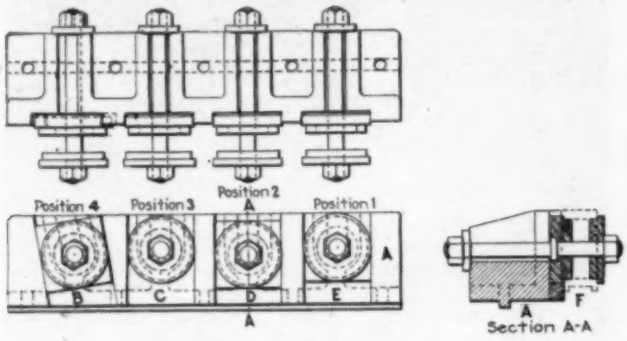


FIG. 10—DETAILS OF FIXTURE FOR HOLDING BRASSES

the table but the fourth, *B*, is at the correct angle to mill the wedge or "take-up" side of the rod brass. The brasses are located by the recesses and held firmly in position by the through clamping bolts and the collars shown at *F*. The method of handling in the machine is shown in Fig. 9.

Simplification of Wire Goods

The interesting story that follows was recently sent to the Fabricated Production Department of the Chamber of Commerce of the United States by one of the largest producers of wire goods:

"You may be interested to know of the following two instances of standardization which have come somewhat under my personal direction in the course of my acquaintance with the wire business.

"The first of these occurred several years ago and was largely influenced by war conditions, but I am happy to say has survived the stringent necessity of war times and has been propitiated in these times because it has provided its worth. The second instance is one of very recent occurrence.

"On Sept. 1, 1917, there was adopted a new standardized set of stock sizes of poultry netting. Up to that time there was no definite standard list generally adhered to by the various manufacturers of this product throughout the country. This was not giving the best results and was wasteful. It was felt that many items could easily be cut out and so doing would not only not handicap the users of poultry netting but by reason of elimination of unnecessary duplications or similarities would result in consequent greater production and better service. There were listed as regular standard stock items prior to the change *820 different sizes*. These covered different meshes, sizes of wire, widths and finishes. The list of standards adopted Sept. 1, 1917, cut the number of *regular stock items to 196*. In other words there was an elimination of *624 items* from the regular standard stock list.

"From the point of view of the jobbers and dealers we know from comments that have been passed along to us that it has been accepted as a wise move and has given highly satisfactory results because of elimination of items which under the old arrangements would perhaps have to be carried by the dealers to some extent. To the consumer no harm has been caused because there are still plenty of items available to meet all needs in a satisfactory manner.

"The second of the instances which we have referred to above is in connection with kitchen household wire goods. We recently had occasion to go over our list with great care and we have taken a list of *902 standard stock items* and have from this list, effective Jan. 1, 1923, *cut 487 items*, reducing the list to *415 items*. It is of course too early to know just what results will come from this action but we believe these results cannot fail to be anything but satisfactory, both from the point of view of production, manufacturing expense and service to our customers.

"No doubt there are other items which we manufacture, which, when we investigate conditions, may be possible of some similar action. If we find that this is so we shall have no hesitation in attempting to bring about results similar to those which we have outlined in this letter."

Holding Up the Inspector's Hands —Discussion

BY C. F. HASTINGS

The article entitled "Holding Up the Inspector's Hands," by O. C. Richards, on page 262, Vol. 58, of *American Machinist*, is an excellent expression of the foreman's responsibilities and his proper attitude toward the inspector.

Ofttimes, the inspector is believed to be, by some foremen, a man placed in his department for the sole purpose of criticising and holding up production, while in reality, he is placed in the department to function as another pair of foreman's quality eyes, and is really the foreman's helper and protector.

The inspector, however, has a responsibility toward the foreman and if he will get the spirit expressed in the following quotation, his presence will be appreciated and his chances for advancement much greater.

"It requires very little ability to see flaws or find fault. A measure of knowledge, and of power, is essential to perceive what is commendable, or to build up what is of value. An ounce of constructive aid is worth many tons of destructive criticism."

Grinding Bevel Gears True With Pitch Circle

By MILTON WRIGHT

Thin section warped in heat treating—Device for clamping and truing preliminary to grinding—Grinding the tips of teeth

THE BEVEL driving gear of an automobile is usually made without a hub and is designed to be bolted to the spider of the differential. Because of this condition it is evident that the back of the gear, which is the surface that bears against the spider in the final assembly, must be true with the pitch circle of the teeth in order to insure efficiency and quietness.

The large diameter and relatively thin section of the disk upon which the teeth are cut render the piece a rather difficult one to handle in the heat-treating operation, and warpage or distortion is bound to be present. A grinding operation upon the back is therefore necessary to restore the gear to its original true running condition.

FIG. 1—DEVICE FOR TRUING THE GEAR

Of the many methods devised for holding the gear for grinding so that the pitch circle will be true, the one here described is, perhaps, as simple as any and represents the practice of a large manufacturing concern that has handled this class of work for many years.

The truing device, shown in Fig. 1, consists of a base having at one end a boss in which turns an upright spindle, or stud, and at the other end a standard upon which slides a block carrying a dial indicator. The block can be fixed at any required height to accommodate the different thicknesses of the several kinds of gears to be trued and the standard is adjustable horizontally to correspond to the different diameters.

After heat treating and before coming to the truing operation the hole is ground true with the outer diameter of the gear. For this operation the gear is clamped to the true faceplate of an internal grinding machine. No attention is paid at this time to the sidewise distortion of the disk for the reason that the thickness of the web is so small, relative to the diameter of the gear, that any departure from parallelism of the ground hole after the final truing may be safely ignored.

The Truing Device

The spindle of the truing device turns freely upon ball bearings. A faceplate having a central boss to fit the ground hole in the gear fits closely upon the spindle. The faceplate is not screwed to the spindle in any way but is simply a push fit on the spindle as upon an arbor. The central boss is of sufficient length to project slightly above the upper surface of the web as the gear lies upon the plate.

From the back, or under surface of the plate, four small setscrews are inserted, so that the gear in position lies upon the rounded points of these screws rather than upon the plate itself.

In the upper side of the faceplate are three capscrews which, from their position within the diameter of the central boss previously mentioned, do not interfere with laying a gear upon the plate. A steel disk about ¼ in. thick and of a diameter great enough to overlap the web of the gear, yet still small enough to fall within the circle of the teeth, is held by these capscrews. This disk with its screws constitutes a clamp by means of which the gear is firmly bound to the plate.

To facilitate rapid handling of the device—that the capscrews need not be entirely withdrawn and replaced at each change—the corresponding holes in the clamping disk are circumferentially elongated slots large enough at one end to go over the screw heads; therefore

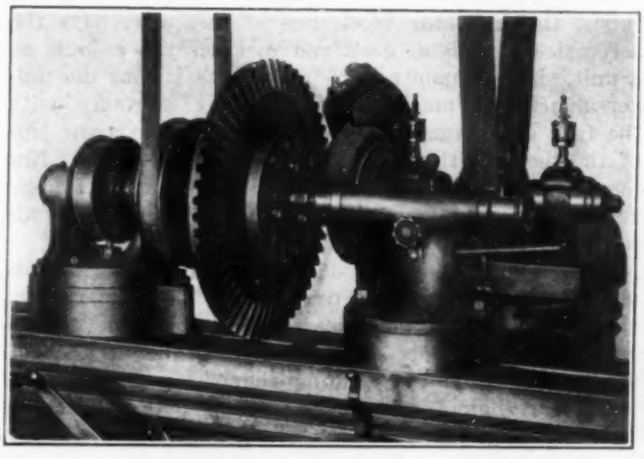


FIG. 2—GRINDING TIPS OF THE TEETH

the operator has only to drop the disk into place and give it a partial turn with his fingers to bring the narrower part of the slots under the heads of the screws, ready for clamping.

Four setscrews in this disk are opposed to the four in the faceplate and when the disk is clamped by the capscrews it bears, not upon the web of the gear, but upon the boss of the faceplate so that when the gear is in place it lies between the flanges of a rigid spool but does not necessarily touch either flange. By manipulating the upper and lower setscrews the gear may be tilted up or down at any given spot until the pitch circle has been trued.

The lower end of the measuring spindle connected with the dial indicator terminates in a hardened steel ball of the right diameter to be stopped at the pitch line of the gear when it enters a tooth space. Once the standard is adjusted to position so that the ball is at the right radial distance from the center of the gear it need not be changed until it is necessary to reset the device for a gear of different diameter.

The measuring spindle is held away from the gear by a spring and is brought into action by depressing the finger-lever in the block. A single movement of this lever pushes down the spindle until the ball contacts with the gear at the pitch line and at the same time registers its position upon the dial.

How the Gear Is Indicated

The operator rotates the gear intermittently, gaging every tooth space or every second space as his experience may dictate, and with a piece of chalk jots down upon the convenient surface of the disk the plus or minus variation from a zero reading. After going around the gear once he can tell from his chalked notations which pair of setscrews to manipulate in order to bring the pitch circle true.

It would be impossible, of course, to reach a zero reading for each tooth space or even for every second space, so he is satisfied to get the zero registration at six equidistant points, and in this equal division he is helped by the position of the three capscrews.

The job is not unlike that of truing a piece in a four-jawed chuck except that it is somewhat more complicated. The particular point to be raised or lowered cannot be adjusted without affecting all other points in the circle. Skill and judgment are needed in order to manipulate the right pair of setscrews and especial care must be exercised to avoid bending the disk out of its natural position.

When a gear is trued to the operator's satisfaction, he raises the indicator block out of the way, lifts the assembled faceplate, gear and disk off the spindle as a unit, slips it upon an arbor and sets it into the universal grinding machine shown in Fig. 2, where, with the face of a saucer wheel he grinds the extreme tips of the teeth at the inner ends to a true surface. Not more than a few thousandths of an inch of metal are removed at most from the highest teeth and he grinds to "leave evidence" upon the lowest ones.

When this grinding is done the "spool" may be disassembled, ready for the next gear. The true ring at the gear tips is the surface against which the gear is held to the faceplate of a similar machine in the following operation of grinding the back. The gear is trued for diameter by means of an indicator in the hole already ground, but no further grinding of the hole is necessary.

Filing the *American Machinist*

By George E. Hodges

Much has been written about filing the numbers of *American Machinist* and successful methods have been discussed. The writer, however, believes that he has a better way than any described.

A vertical steel file costing about forty dollars is used. The magazines are filed as bound by the publishers, doing away with the cost of folders and keeping the copies in better condition than does any folder yet devised. The binding of a magazine has been carefully thought out by the publishers, and there is nothing to be gained by breaking it. The bulk of the advertising is the stumbling block in most of the filing systems, whereas it should be a stepping stone to greater profit. It is, if you are intensively using your magazine. The time saved by not discarding the advertising section will alone offset the cost of the extra filing space. The cost of the folders is saved, the magazine is in better condition, and you have a vast amount of illuminating information in your files that is actually valuable. Don't throw away the advertising section. Files of this nature grow in value with the years.

In maintaining the file, the writer frequently makes notes of parts of articles. These notes are made on separate pieces of paper and filed in the magazine. The writer also makes use of charts of business conditions, which are filed with each issue between the cover and contents page.

Controlling indexes are made up providing quick reference to any article touching upon production work, the article, page and volume number being found under the operation or operations required on the work. These indexes are kept in a folder marked "Production."

All the management articles are indexed under the phase of management to which they belong, as Selling, Relations, Service. The serial articles are indexed by sub-headings. A folder is devoted to management and one to serials.

The magazine, when ready to file, is ready for the indexing, which is short work if a good plan is used, and the work done regularly. The magazine is placed in the file with the closed edge up, to show the volume, issue and page numbers.

Properly kept, the magazines become at once an investment of high quality and a source of companionship and inspiration. Many of us, especially those who had but a fleeting glance of Chordal's letters, would appreciate having every one of them in our files. There is no doubt that there are among the contributors many who will earn much respect and admiration with their work. To have their best efforts is golden opportunity if we but avail ourselves of it.

Production of Automobile Bodies and Parts During 1921

According to the *Washington Service Bulletin*, the 1921 census figures show that there were 19,074 establishments producing automobile bodies and (or) parts, reporting products valued at $5,000 or more. The value of the products showed a decrease of 41.1 per cent from 1919 to 1921, but an increase of 214.7 per cent for the 7-year period since 1914.

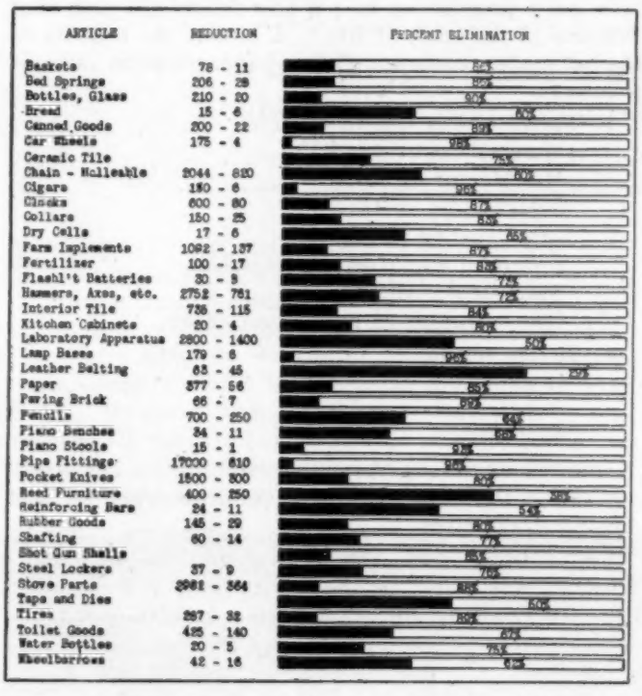
Tomorrow's Profits from Today's Wastes

By PAUL E. HOLDEN
Fabricated Production Division, Chamber of Commerce of the United States

Too much variety of product wipes out profits—Benefits of simplification to producer, jobber and consumer —Progress of simplification in American industries

NOT LONG AGO an executive summoned the heads of his several departments to determine why last year's increased business, amounting to over $300,000, had resulted in a net profit of only $8. The diagnosis that followed showed the business to have been suffering a virulent case of too much variety. There had been a persistent catering to the whims and fancies of the buyers and an effort to satisfy the insatiable demand for "something different."

There is much significance in this business story which is indicative of the situation existing in many industrial establishments. The policy of "we make anything our customers call for" is distinctly fallacious. How much more substantial is the one, "we endeavor to serve the consumers' needs?"


ARTICLE
REDUCTION
PERCENT ELIMINATION
Baskets 78 - 11 86%
Bed Springs 206 - 28 86%
Bottles, Glass 210 - 20 90%
Bread 15 - 6 60%
Canned Goods 200 - 22 89%
Car Wheels 175 - 6 97%
Ceramic Tile 75%
Chain - Malleable 2044 - 820 60%
Cigars 180 - 6 96%
Clocks 600 - 80 87%
Collars 150 - 25 83%
Dry Cells 17 - 6 65%
Farm Implements 1092 - 137 87%
Fertilizer 100 - 17 83%
Flashl't Batteries 30 - 9 71%
Hammers, Axes, etc. 2752 - 761 72%
Interior Tile 726 - 115 84%
Kitchen Cabinets 20 - 4 80%
Laboratory Apparatus 2800 - 1400 50%
Lamp Bases 179 - 6 93%
Leather Belting 65 - 45 69%
Paper 377 - 56 85%
Paving Brick 66 - 7 89%
Pencils 700 - 250 64%
Piano Benches 34 - 11 68%
Piano Stools 15 - 1 93%
Pipe Fittings 17000 - 610 96%
Pocket Knives 1500 - 300 80%
Reed Furniture 400 - 250 38%
Reinforcing Bars 24 - 11 54%
Rubber Goods 145 - 29 80%
Shafting 60 - 14 77%
Shot Gun Shells 85%
Steel Lockers 37 - 9 76%
Stove Parts 2981 - 364 88%
Taps and Dies 50%
Tires 287 - 32 89%
Toilet Goods 425 - 140 67%
Water Bottles 20 - 5 75%
Wheelbarrows 42 - 16 62%

PROGRESS OF STANDARDIZATION IN VARIOUS INDUSTRIES

That there is unnecessary waste in industry is well known but its extent is not so generally appreciated. Admittedly many sources contribute to this avoidable waste prevalent in industries today, and no one element is responsible for all. It is well stated, however, that one of the outstanding wastes chargeable to management is excess variety and lack of standardization in manufactured products. As a war measure, most industries operated under greatly curtailed schedules, but we lived through it without serious inconvenience, being more disturbed than injured. Yet upon the withdrawal of restrictions many slipped back into the old order of business, and one of the most essential lessons taught at that time appears to have been forgotten. If a definition of the production ideal were to be made it could be very tersely stated as: small variety and large volume, or, in other words—mass production.

Practically synonymous with mass production is simplification and standardization. No manufacturer ever enjoyed the benefits and economies of mass production who was making everything his customers called for. Nor was he able to produce for stock during seasonal or other slack periods, because no plan which he could follow would insure a demand for what he might elect to make up. There are manifold savings accruing to the manufacturer from simplification and standardization, some of which are as follows:

1—Less capital tied up in
  Raw and finished materials
  Tools and equipment
  Storage space
2—More economical production through
  Longer runs
  Better planning
  Less defective work
3—More efficient labor due to
  Repetitive processes
  Simplified training
  Permanent employment
  Opportunity for wage incentives
4—Better service to the trade
5—Concentration of sales effort
6—Decreased overhead
7—Fewer shut-downs
8—Better product
9—Increased turn-over.

For more than two years the Fabricated Production Department of the Chamber of Commerce of the United States has been promulgating the idea of simplification and standardization, and active contact has been had with several hundred various lines. The movement has

extended into numerous industries and noteworthy results have been achieved by many. Some have been the result of a co-operative action by an entire industry and others are individual in their scope. Obviously, the most effective method is through co-operation, but the practice is one in which any company or group of manufacturers can well engage. The chart shown lists a number of simplification accomplishments which can be measured in real savings.

Simplification and standardization, however, does not end with the completed product. Its application is being extended to such items as component parts, purchased parts, terminology, performance, specifications, capacities, raw materials, etc.

Component parts standardization is one phase which should be of particular interest to the machine industry. Unquestionably a wide variety of component parts, particularly those of a non-competitive nature, could well be standardized, if not throughout the entire industry, at least within the individual plants. There is no good reason why every part should be designed especially for each size and type of machine. Take for instance the machine tool industry. It would seem that there could be well established standards for the whole industry set up for such items as cone and single pulleys, tool posts, T-slots, collets, tapers, etc.

The extent to which this practice is followed in the automotive and cycle trades is too well known to require repetition. Nevertheless, there is one fact that cannot be told too often—that of the saving realized. It is estimated by competent engineers that the automotive industry alone has effected a 15 per cent saving through standardization. Based on an annual output of approximately $2,000,000,000 the saving would appear to be very much worthwhile. As an individual activity, one progressive concern has placed display boards in its design room and on these has mounted various bolts, nuts, thumb wheels, and other parts which are now used on models in current production. When a new model is being developed the designers have explicit instructions to utilize, wherever possible, those parts already in production and for which drawings, tools, jigs, and other manufacturing equipment are already available. To measure in dollars and cents the net saving of this policy would be difficult, but it is obvious that production costs are considerably lowered and that raw material and component parts inventories are reduced.

Much has been said here with regard to the benefits accruing to the manufacturer, but standardization and simplification is not single purpose. The jobber and consumer are equally interested. The jobber, with a warehouse full of slow moving merchandise and bins loaded with divers spare parts, is vitally concerned in any movement which tends to reduce his overhead and increase the frequency of his turnover. As evidence of this interest, a number of retail and wholesale dealers associations have gone on record as strongly urging manufacturers to co-operate in eliminating excess variety and reducing their several lines to those items of real merit and distinction. Here are some of the gains for the jobber:

1—Increased frequency of turnover due to
- Cleaner stock
- More effective sales force
- Staple lines
- Concentration of sales effort
- Quick moving items

2—Reduced capital investment in
- Stock carried
- Repair parts
- Storage space

3—Less stock depreciation

4—Less unsaleable goods

5—Decreased overhead from
- Smaller force
- Lessened investment
- Reduced fixed charges
- Lower handling costs

6—Better service through
- Fairer prices
- Balanced stock
- Quicker deliveries.

As for the consumer, whose interests are of primary concern, it is not reasonable to presume that he will look with equanimity upon a situation wherein he pays a premium because of lack of interchangeability or standardization. Aside from the actual dollar and cents cost, there is also the serious loss occasioned by the replacement part delays incident to breakdowns. At such a time the customer usually finds that the distributor cannot furnish him the repair parts and he is referred to the factory where as likely as not the parts have to be made and it is days and sometimes weeks before he is able to make the repairs. It would be a hard proposition to sell this fellow the idea that "variety is the spice of life." A few of the benefits to the ultimate consumer from standardization are as follows:

1—Fairer prices due to reduced
- Material costs
- Manufacturing costs
- Distribution costs

2—Better quality through
- Improved manufacturing methods
- Stabilized products
- Concentration of production efforts

3—Better service on
- Completed product
- Repair parts
- Re-orders.

In carrying out a program of simplification and standardization there are several general observations that suggest themselves:

1—To be effective, the motives and desired results must be understood by the industries and trade alike.

2—To preclude adverse reaction, all interested elements should be represented and have a voice in the proceedings.

3—To obviate constant revision, all steps taken should be based on good practice and scientific fact.

It must be observed that in all of this movement to standardize and simplify there is no intention or suggestion to in any way impair advancement or stifle individuality. In fact, the degree of individuality we manifest is a measure of the progress of civilization. No well thinking adherent of standardization desires to see commodities reduced to a common pattern. On the other hand, variety for variety's sake is a dangerous doctrine. In modern industrial management it would seem that an essential test of ability would be keeping the plant free from slow moving, non-paying varieties and the constant improvement of service to the trade.

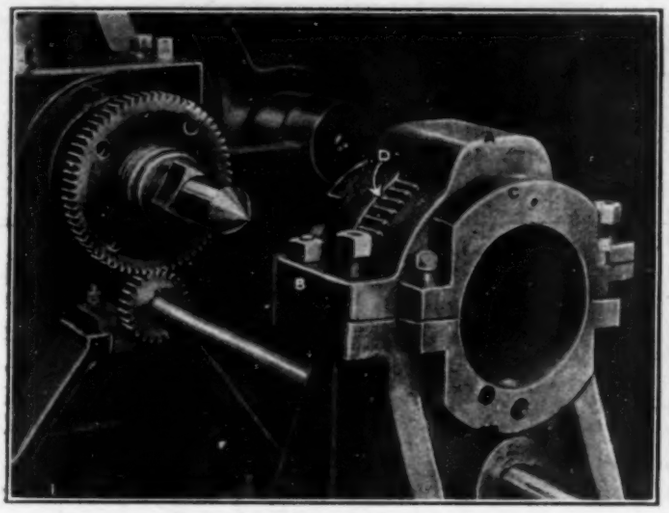


FIG. 1—MACHINE FOR TURNING LIFT-SHAFT JOURNALS.

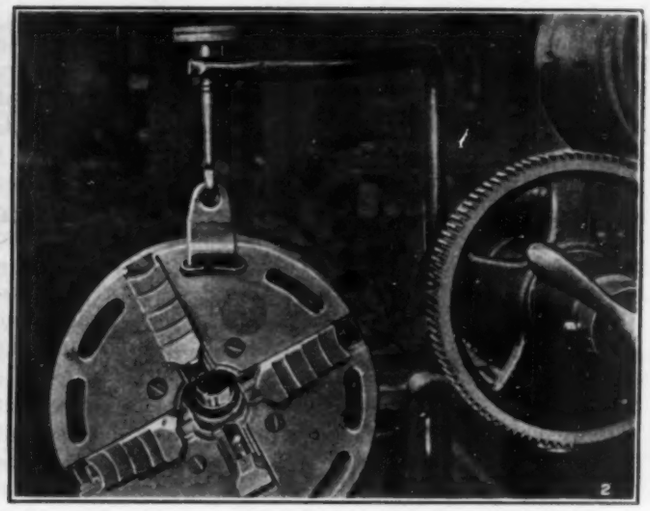


FIG. 2—CRANE FOR HANDLING A LATHE CHUCK

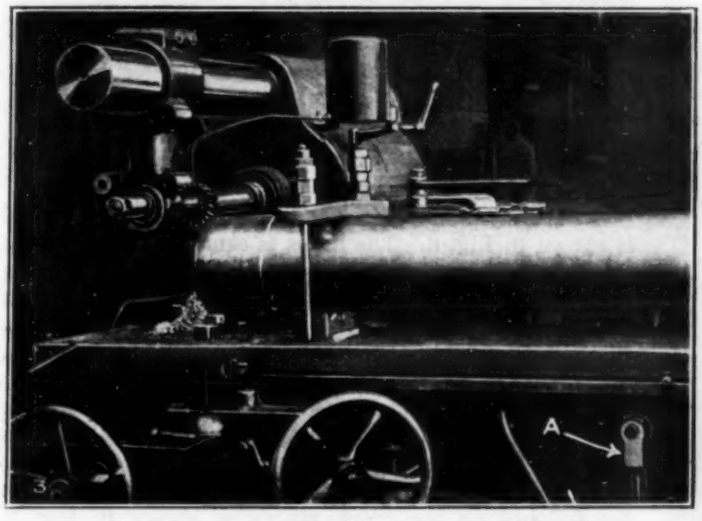
Repair Work in a Georgia Railroad Shop

BY S. ASHTON HAND
Associate Editor, *American Machinist*

Machine for turning lift-shaft journals—Keyseating and milling operations—Machining crown brasses — Planing curved surfaces — Making link blocks

TURNING THE JOURNALS on lift shafts is more or less an awkward job, depending on the facilities at hand for doing the work. When the journals are outside of the arms, the turning can be done in an ordinary lathe by the use of comparatively simple devices, some of which have been described in former articles. However, when the journals are inside of the arms, the job must either be done in a very large lathe or in some machine especially adapted for the work.

An old lathe fitted with attachments for lift shaft work and in use in the shops of the Central of Georgia Railway, Macon, Ga. is shown in Fig. 1. A head as at *A*, driven by gears from shaft *B*, is mounted on the carriage. The revolving sleeve *C*, of which the gear *D* is an integral part, is made in halves and can be removed from the head by taking off the cap. In operation but one half of the sleeve is removed for the insertion of the shaft. The turning tool is adjustably mounted on the flange of the sleeve nearest the headstock and longitudinal feed is provided by movement of



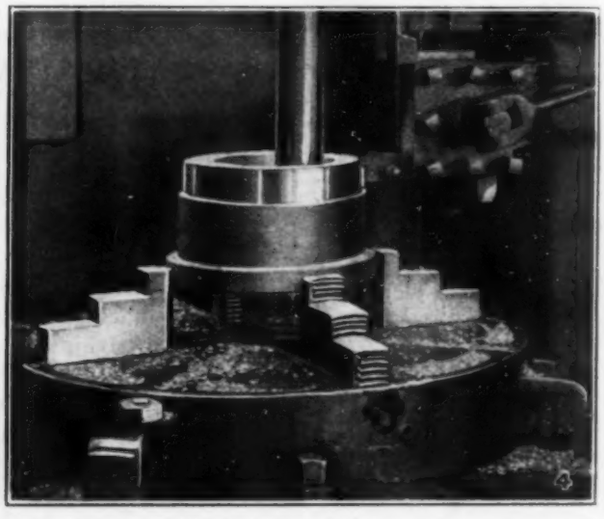


FIG. 3—KEYSEATING A DRIVING-WHEEL AXLE. FIG. 4—MACHINING A ROD BRASS

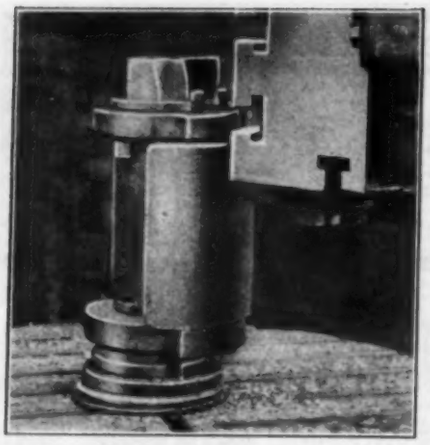


FIG. 5—MACHINING A CROWN BRASS

the carriage. The shaft is held between centers for alignment and the projecting arms rest against the front of the lathe bed and prevent the shaft from turning under the pressure of the cut.

A convenient method of handling a lathe chuck is shown in Fig. 2. Here a small crane made from bar steel and attached to the back of the lathe bed, holds the chuck when it is not in use and when swung around brings the chuck opposite to the spindle nose. The chuck is attached or detached by revolving the spindle in one direction or the other, being supported meanwhile by the crane. A knurled nut at the top of the rod to which the hook is attached, serves to raise or lower the chuck and align it with the spindle.

Keyseating a driving-wheel axle is shown in Fig 3. Here the work is being done on a heavy milling machine of the knee type. While the machine itself is more than heavy enough for the cut, the overhanging weight of the axle and table is so great as to require the use of the roller support *A*.

A Useful Machine

The vertical lathe has simplified many jobs in the railroad shop and is especially useful in machining packing rings and other work where both boring and turning can be carried on simultaneously. Such a machine is to be seen in Fig. 4 boring and turning a rod brass. The boring is done by a tool carried by one of the heads of the cross rail, while the tools in the revolving toolblock on the side head face the upper end, turn the body and square up the inner face of the flange. The only other work necessary to be done to complete the job is to reverse the brass in the chuck and turn and face the flange which are short operations, the tools being already in place in the revolving toolblock on the side head.

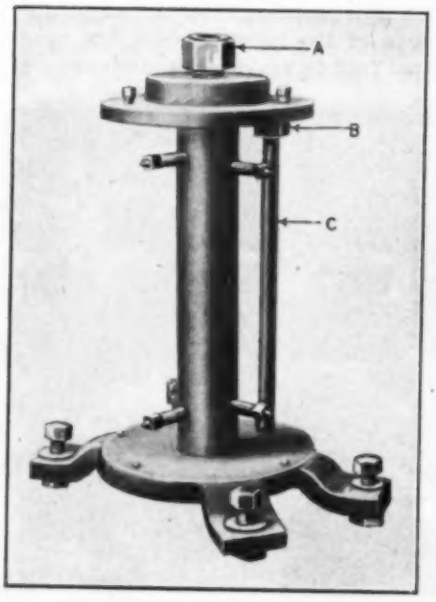


FIG. 6—FIXTURE FOR TURNING CROWN BRASSES

Crown brasses are machined for the fit in driving boxes either by turning, shaping or slotting, the latter operation being shown in Fig. 5. Shaping or slotting offers the advantage over turning of being able to finish the edges where they fit the angled pockets of the boxes at the same setting as in machining the outsides.

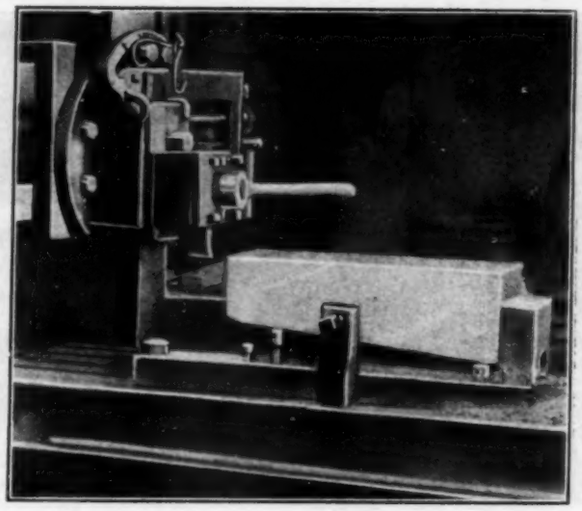


FIG. 7—PLANING A WEDGE

The shaper has the advantage over the slotter in that its stroke is longer and it can handle brasses that are too long for the limited stroke of the slotter.

In some of the heavier types of locomotives, crown brasses as long as 22 in. are used, too long to be machined in any of the slotters to be found in the average railroad shops, so resort must be had to machining them in either the lathe, shaper or boring mill. The latter machine offers many advantages over the lathe for this class of work, one of the principal ones being the ease of placing and adjusting the work.

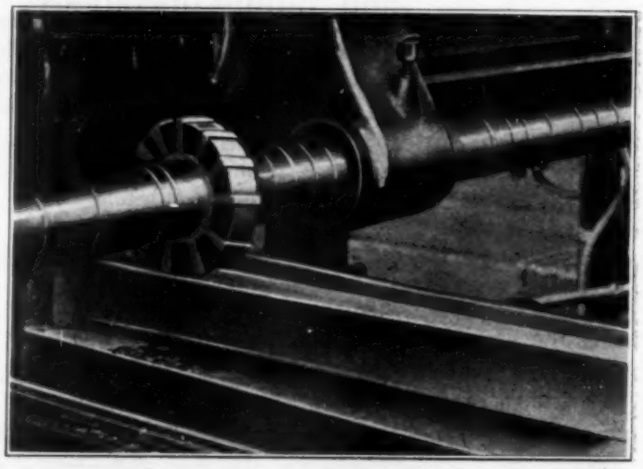


FIG. 8—MILLING CHANNEL IN A CONNECTING ROD

A fixture for holding long brasses on the boring mill is shown in Fig. 6. The brass is centered by adjusting the pointed screws to be seen projecting radially from the central column and is held between the plates at the top and bottom. The plate at the top acts as a clamp, being adjusted by the nut *A* which also acts as a fulcrum when clamping pressure is applied, by screwing out the nut *B* on rod *C*. Cup pointed screws, three in each plate, bite into the top and bottom of the brass and hold it securely.

The bearing faces of driving box shoes and wedges are finished on the crank planer as shown in Fig. 7. A tongue on the fixture enters the channels in either

shoes or wedges and levelling and setting to the proper angle are done by adjusting the capstan-head screws to be seen in the fixture base.

Milling the channels in connecting rods is done on an Ingersoll planer-type milling machine as shown in Fig. 8. As the rods are tapered and the flanges are of the same thickness throughout the length it is necessary to take two cuts, resetting the rod for the last cut.

In some of the large locomotives, the inside edges of the flanges of the driving boxes are planed as shown

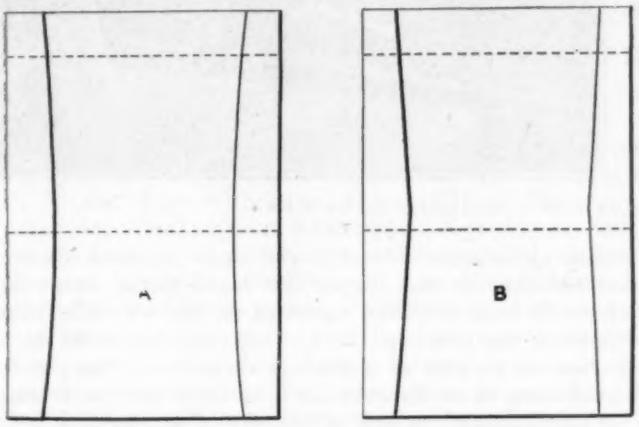


FIG. 9—METHODS OF MACHINING ROCKING DRIVING-BOXES

at *A* in Fig. 9. Boxes so planed are known as rocking boxes and allow the upper part of the locomotive to lean or sway in going around sharp curves without cramping the shoes and wedges between the flanges of the boxes. In planing the rocking boxes, some shops plane the inner sides of the flanges to double tapers as at *B* but in this shop they are planed to curves as at *A*.

The boxes are ganged in two rows on the planer table while between the rows, cam plates mounted in fixtures such as shown in Fig. 10 are strung out in series, occupying the full length of the table. The device to be seen at *A* is mounted on the crossrail of the planer

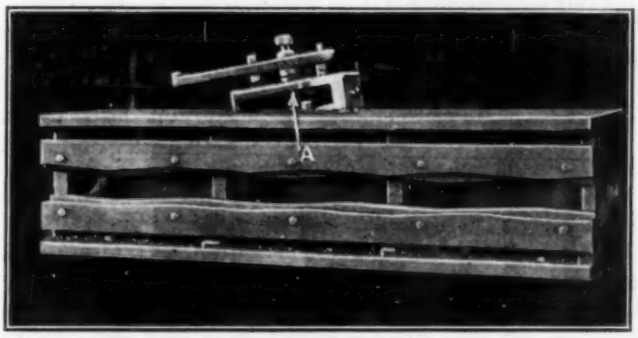


FIG. 10—CAM USED IN PLANING ROCKING DRIVING BOXES

and by means of proper connections, as shown in Fig. 11, causes both heads of the planer to follow the sinuous path of the cam. *A* is the device referred to; *B* is the end of one of the cam plates, while *C* and *D* are the rows of driving boxes. The roller *E* fits in the cam slot and, following the path of the cam as the planer table travels, causes the vertical lever *G* to oscillate sidewise.

Connecting rods *H* and *I* attached to lever *G* and to the planer heads cause the heads to move in opposite directions but in unison with lever *G*. The planer heads are, of course, disconnected from the crossfeed screws.

With the tools set as shown the inner flanges of both rows of boxes are planed. To plane the outer flanges, connecting rod *H* is connected to the head at the left and the rod *I* to the head at the right, these new positions being represented by the dotted outlines of the rods at *K* and *L*. The tools must be transposed and the aprons swung in the opposite direction from that shown. As the heads are independent of the crossfeed screws, setting the tools for depth of cut is done by swinging the aprons.

Referring again to Fig. 10, it will be noticed that there are two sets of cam plates, one below the other, the lower set being designated by *M* in Fig. 11. The two sets of cam plates are for planing separate types of boxes. By mounting the cams as shown, but one set of fixtures is necessary, the only change being the substitution of a longer lever in place of the one at *G*.

The greatest wear on valve-motion links takes place near the center, as a locomotive runs hooked up nearly

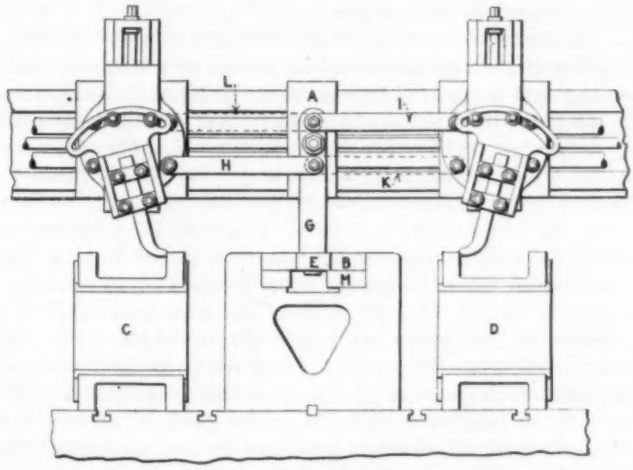


FIG. 11—HOW ROCKING DRIVING BOXES ARE PLANED

all of the time. In regrinding links much time can be saved by first closing them in slightly at the point of greatest wear so as to average the amount of metal to be removed. For this work a simple press such as the one shown in Fig. 12 will suffice. Even case-hardened links can be closed in by careful manipulation without danger of their cracking.

After links have been reground it is necessary to make new link blocks and unless some special facilities for

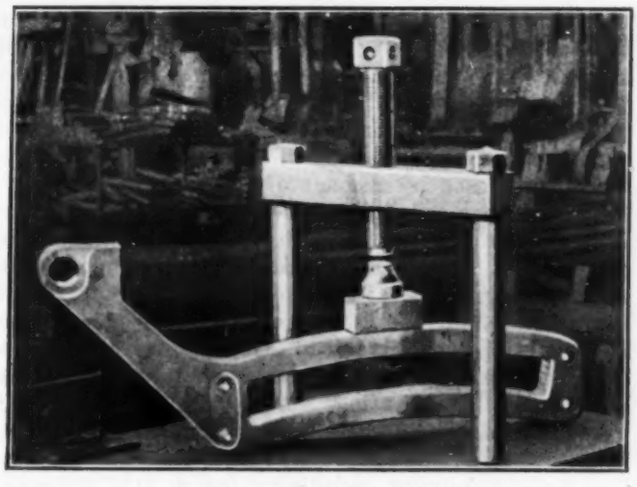
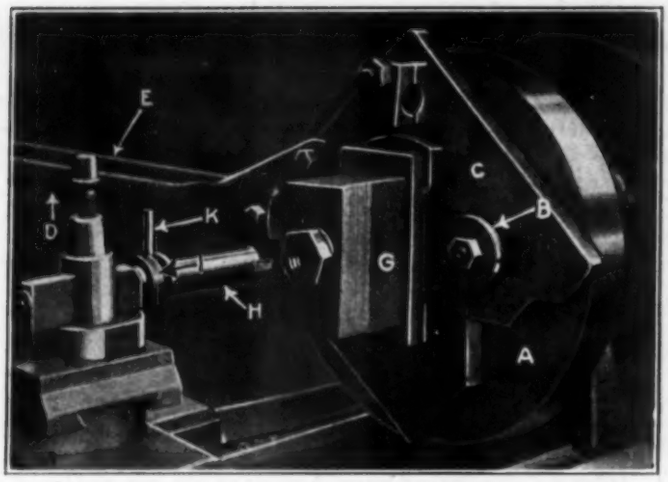
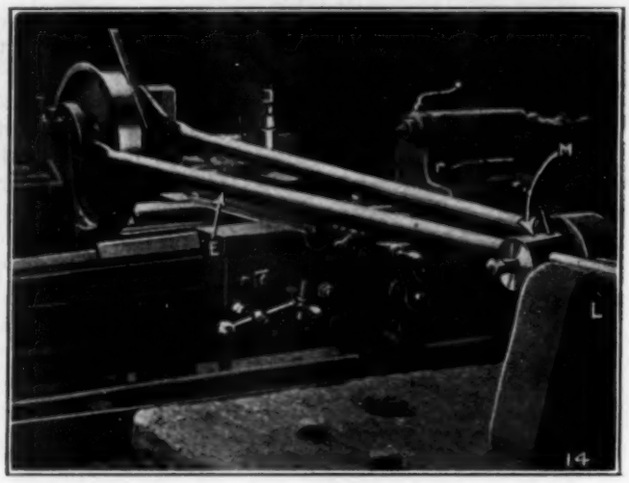


FIG. 12—BENDING A LINK





FIGS. 13 AND 14—LATHE ATTACHMENT FOR TURNING LINK BLOCKS

machining the curved surfaces are at hand, their making is a somewhat tedious job.

The device shown in Figs. 13 and 14 is for machining the curved surfaces on link blocks in a lathe of small swing and is the invention of F. E. Brown, one of the machinists in this shop, and has been patented by him.

Referring to Fig. 13, *A* is a face plate screwed on the spindle and fitted with a crank pin at *B*. A plate *C*, slotted to span the crankpin is held against the face plate by the crankpin collar. The rod D, attached to plate *C*, is fulcrumed to the stationary rod *E* at a distance from the lathe center equal to the radius center of the link block. It will readily be seen that with the spindle of the lathe revolving, the crankpin must impart motion to the plate *C*, and as it is held against horizontal movement by the fulcrum referred to, the motion so imparted must be in the path of an arc, the radius length of which is governed by the position of the fulcrum. The link block *G* is mounted on a fixture attached to plate *C*, the fixture being bridged over the slot to allow the collar and nut on the crankpin to pass under it, when in operation.

The tool held in the sleeve *H*, is so mounted on its shank as to allow it to lift and clear the work on the back stroke. A cam-shaped slot *I* and pin *K* cause the sleeve to move slightly rearward as the tool lifts thus allowing the point of the tool to clear the work in a horizontal as well as a vertical direction. The pin *K*, in addition to its function as a cam pin, acts as a stop, bearing against the end of the slot when the tool is in cutting position. A spring returns the tool to cutting position on the completion of the back stroke.

In the illustration the tool is set for machining the concave surface of the block. For machining the convex surface, the sleeve is turned half way round and the tool reversed, the cam-shaped slot being long enough to permit this adjustment.

The method of mounting the attachment on the lathe is shown in Fig. 14. The stationary rod *E* is attached at one end to the protruding end of the spindle box by a collar and the other end rests in a notch in the block *L* standing on the bench. The fulcrum *M* can be secured at any position on the rod to suit the radius of the link block to be machined. Graduations on one of the rods facilitate the setting to any radius length that has been previously determined.

Typical German Automobile Contracts

By Henry Obermeyer and Arthur L. Greene

A good indication of what the fluctuating value of the mark means to German manufacturers is given by the sales contracts in use by two of Germany's best known automobile builders. The contract of the Adlerwerke follows:

"We must refuse any claims or pretensions for indemnification or payment of interest whatsoever which might be caused on account of any unforeseen delay. The order may only be cancelled if the original promised term of delivery, including a certain reasonable prolongation of time should be exceeded by more than about four months. In the event of interruption of manufacture, strikes in our works, troubles, want of raw materials, or coal, and in case of any circumstances out of our own, or our principal suppliers' responsibility and control (mobilization, war, seizure, prohibition of export trade, measures of Government and force majeure) we shall be free from keeping strictly the promised time of delivery, including a few months prolongation. In such cases, either the buyer or the seller is entitled to retire from his contract, if after a lapse of about six months delivery should not have been made. If no use is made immediately of this right to retire from order, the contract shall remain in force and rest ineffective only until regular conditions of manufacture will have taken place again."

The Daimler company provides that: "Should at the time of delivery our list prices be higher, we reserve the right to ask the increased price. In this case the customer is entitled to withdraw from the contract within a fortnight, but without indemnity of any kind to or from us provided that the new price exceeds the former one by more than one-third of the basis price. On the other hand if at the time of delivery our list prices are lower than those quoted in our offer or confirmation of order, the reduced prices will be asked. This clause applies to chassis and bodies as well as to lighting and self-starting and all other accessories. Our list prices apply also to parts not made in our works."

The clauses regarding war, mobilization, etc., are here also observed as in the other contract.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The ninth article—Correct pricing of material—Simplifying the inventory problem—Three methods of pricing issues and their adoption to worked material pricing

THE CRITICAL POINT in the successful operation of a perpetual inventory account is the pricing of the withdrawal of material. If the control of production has been developed as it should be, there ought to be little difficulty in maintaining a relatively accurate quantity inventory in some such manner as was described in the previous article in connection with the balance card. If the cost department and accounting department receive correct information about the values received and withdrawn then it is usually easy to maintain correct accounting records. The difficulty lies in the translation of the physical quantities, such as pounds, pieces and feet into dollars and cents. The key to the problem lies in attaching the right prices to the materials as they enter and especially as they leave the storeroom and the material records.

Relationship of Cost and Planning Departments

The pricing of issues marks one of the most difficult points of contact between the planning department and the cost department. The pricing does not in any way affect the subsequent work of the planning department and hence it is not easy for them to check their own work. For these reasons it is hard for the balance clerks to take the pricing part of their work seriously. On the other hand, the cost department is not well situated to check the accuracy of this pricing and yet most of its costs depend in a large measure on the correctness of these data. Hence it behooves the management as a whole to give careful attention to the problem if it wishes to have reliable statistics on which to base its judgments. This is one of the places where the closest co-operation is necessary between certain functions and those who are in charge of the functions.

There are various places where the pricing of materials might be done, but it usually means a certain duplication of effort if it is not carried on at the time when the entries for the material are made on the balance cards. In the discussion which follows, therefore, it will be assumed that such a method is followed.

The Inventory Problem

Before going on to a further investigation of the question which most immediately concerns us, it may be well to pause long enough to look somewhat briefly at the whole inventory problem. Formerly it was considered satisfactory practice to take one physical inventory a year. The inventory account was set up at the beginning of the year with the value ascertained from the physical inventory and then this account was charged with all purchases of stores throughout the year. At the end of the year another physical inventory was taken and the difference between the old inventory plus the purchases and the new inventory was treated as the value of the stores used in production throughout the year. The inaccuracies and failures of this method have been so clearly pointed out so often as not to need discussion. Losses and theft of materials, inaccuracies in count, the overlooking of some items, the entire disregard of price fluctuations and the tardiness of the reports based thereon will contribute to make the method practically worthless. It is remarkable that so many concerns still use such a method and yet are able to avoid bankruptcy.

All up-to-date companies have replaced this kind of inventory keeping by what is commonly known as a "perpetual inventory." The theory of the plan is to record what is on hand at the beginning, add what is later obtained, subtract what is withdrawn and the balance will show what is actually on hand at the moment. Reference to the previous article will show that this method was just what was described in regard to the "on hand" column of the balance card. When quantities of materials are the only figures to be handled, there is no special difficulty in keeping the records, provided there are no inaccuracies in measuring these quantities. Sometimes, it is true serious trouble comes there. It is when the inventory is turned into dollars and cents in the inventory accounts that inaccuracies arise.

Example of Common Inaccuracies

It is perfectly obvious that if materials were added to the inventory as pounds and withdrawn as pieces, unless each piece happened to weigh a pound, the inventory would be incorrect from the start. It is frequently overlooked that the same result is attained if the materials are charged to the inventory account at 50c. a pound and withdrawn at 60c. or vice versa. It is not surprising, therefore, that when the entire inventory is checked it is found that the perpetual quantity inventory is often substantially correct, while the inventory accounts are very different from what was expected. It is absolutely essential that materials should be priced out at the *equivalent* if not the *same* price at which they are received.

Let us consider first the question of transferring prices to the balance cards in connection with stores and then take up what variations may exist between handling this kind of material and worked material. It will be remembered from the previous article, of course, that stores material is material which is purchased outside and issued to the factory without any change in form

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or condition, while worked material is the material made in the factory and placed in the storeroom to be held for later withdrawal.

The price of stores is the purchase price plus, in some cases, the cost of transportation to the factory if the company buying the material pays it. If the cost of transportation is low as compared with the cost of the material, it is not usually worth while trying to add it to the purchase value, but it is better, rather, to treat it as an expense. If, on the other hand, the cost of transportation is relatively high, then it should certainly be added to the cost value of the material. The method for accomplishing this addition in so far as the ledger account for stores is concerned, will be explained in the next article.

ON HAND

DATE	QUANTITY 10¢	QUANTITY 9¢	QUANTITY	ORDER NO.
4/7	100			P73
4/24	250			P94
	350			
4/28	50			M29
	300			
4/29		150		P105
4/29	250			M35
	50			

FIG. 25—ON HAND SECTION OF BALANCE CARD FOR FIRST METHOD OF PRICING ISSUES

To get the cost price to the balance clerk, it is often convenient to make use of the receiving slip which is sent to the purchasing department by the receiving department and on which is recorded the results of the inspection of the incoming stores. This copy of the slip should be used in "passing the invoice," as the checking of the invoice to see that the quantity billed, the price and the extensions are correct. The price plus the unit cost of transportation can easily be entered on the slip at this time. If the actual cost of transportation is not known—as frequently happens since freight bills are ordinarily rendered only once a month—an estimated cost can be used. With a little experience based on the records of transportation rates, such an estimate can be made closely enough for all practical purposes. As the invoice is usually received before the goods, in most cases it will be possible to pass the invoice and send the copy of the receiving slip used for that purpose to the balance clerk so that it will arrive by the time the copy which goes with the stores to the storeroom reaches the same place. If the receiving slips are numbered consecutively it is very easy to match them if any necessity is felt for checking one against the other.

We have now seen how the exact price may be brought against the material received. The next step is to investigate how it may be carried over and be brought against the material which is withdrawn. There are several different methods of accomplishing this result, but only three will be given here. The first method is illustrated in Fig. 25 which is the "on hand" section of the balance card shown in the previous article. The method is devised in such a way as to keep the different priced materials of the same kind separate on the records. It is a method which will work most successfully when it is desirable to keep the lots of material physically separated in the storeroom. This separation is not at all essential, however, and the method is employed with entire success where no such segregation is practiced.

It will be noted in Fig. 25 that there are three quantity columns but no column for price or value. When the first shipment of material is received, it is entered in the first column and its price recorded at the head of the column. All subsequent receipts of material at this same price are added in this column and all withdrawals are subtracted and the issues by which these withdrawals are made are priced with the price shown at its top. It is perfectly evident that the material so withdrawn is deducted from the inventory at the same value as it was charged thereto.

Entering of Varied Price Orders

The question now arises as to what to do if more material is received on some other purchase order at a different price. When this occurs, the receipt is entered in the second column and the new price is placed at its head. When the material is withdrawn, that price is entered on the issues. It is usually wise to enter all issues in the first column until the stores at that price are exhausted. In this way the changes in price are reflected as soon as possible in the inventory figures.

Any later receipts of stores at still different prices should be entered in the third column and their prices entered immediately above them. Before they are withdrawn they should be transferred to one of the other columns. The third column in this way acts as a sort of reservoir to store up the overflow until it is needed.

While all material is issued at exactly the same price at which it was received, it is evident that the method has some limitations. If there are a great many different prices, it is quite inconvenient to be obliged to record a variety of receipts in one column and confusion is very apt to result. If the exact quantity of material actually on hand at any one time is wanted, it is neces-

ON HAND

DATE	ORDER NO.	QUANTITY	UNIT PRICE	VALUE
4/27	P73	100	$.10	10.00
4/24	P94	250	.10	25.00
		350		35.00
4/28	M29	50	.10	5.00
		300		30.00
4/29	P105	150	.09	13.50
		450		43.50
4/29	M35	250	.0966	24.15
		200		19.35

FIG. 26—ON HAND SECTION OF BALANCE CARD FOR SECOND METHOD OF PRICING ISSUES

sary to add the figures in the three columns together, and this information is not infrequently needed when materials are to be ordered. There is another method which avoids these difficulties and which is quite usable under certain circumstances, though it has other limitations which will be pointed out later.

Second Method of Pricing Issues

The second method is illustrated in Fig. 26. As before, the figure shows simply the on hand section of a balance card. It will be noted that there are columns for quantity of material, its price and value. When material is received the quantity is added in the quantity column, the value in the value column, and the price is entered in the price column on the same line as the other entries. When stores are issued, the quantity is subtracted in the quantity column. The rest of the process is not so easy, however. If the unit prices for the last entries are the same, then it is only necessary to extend the price by the quantity to find the value and this value should then be deducted in the value column and the unit price entered in its column. The price and value should be entered at the same time on the issue. If, however, the last two prices are not the same, they must be averaged first. This result is accomplished by dividing the last total value by the corresponding quantity and in this way obtaining a new unit price. The material issued must then be subtracted and its value ascertained as before.

It may thus be seen that the material is not issued out at the same price at which it was received, but at an average price which is obtained by taking the weighted average of all the prices. Over a considerable period of time, the same results will be obtained in so far as the inventory is concerned as by the previous method, and for any particular moment, though the results by the two methods may vary, there is no reason for holding one of them to be more correct than the others.

There are times, however, when the use of an average price is quite helpful. When prices are subject to sudden and violent fluctuations, the method smoothes out many of the irregularities and really gives more accurate results than the other. The method also provides at all times the total of the material actually on hand without the necessity of any calculation to obtain this total.

Limitation of Second Method

On the other hand there is a serious limitation on the method due to the necessity of stopping to make one extension every time material is issued and often being obliged to make a series of calculations in order to obtain the price. All this means that either scratch pad and pencil must be employed with many consequent inaccuracies, or else that a whole battery of calculating machines be purchased with the resulting heavy investment. If each clerk does not have a machine he will waste time waiting for someone else to finish using one and such a loss is usually greater than the cost of owning the necessary machines. In this respect the method differs radically from the preceding and following method. In both cases it is possible to concentrate in one place the task of extending the issues which only need to be priced when they are entered on the balance card. This practice permits specialization of functions which, in turn, promotes economy.

The third method which is illustrated in Fig. 27 is an effort to combine the desirable features of the other two methods. It will be seen that there are three quantity columns as in the first case, but here one is reserved exclusively for receipts, another for withdrawals and a third for the balance. There are also columns for unit price and two for check marks. When stores are received they are entered in the quantity received column, their price in the unit price column on the same line, and the resulting balance in the on hand column. When material is issued it is entered in the quantity issued column, subtracted from the figure in the on hand column and the resulting balance is entered therein. The price entered on the issue is taken from the unit price column, and the last unchecked price is selected. A lower case letter or some other identifying mark is then placed in the "Ck." columns against the entries affected. If the quantity issued is greater than the quantity received of which the price is taken, then enough is deducted from the subsequent entries in the "quantity received" column to make up the requirement and all entries are checked with the same letter. If some of the quantity received is left over, a notation of

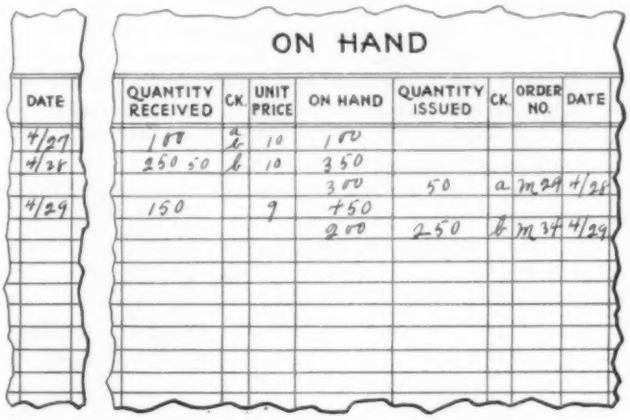


FIG. 27—ON HAND SECTION OF BALANCE CARD FOR THIRD METHOD OF PRICING ISSUES

the amount is made in pencil between the lines and it is used for the next issue. If more than one price is used for an issue, it is necessary to divide the quantity shown on the issue into two parts and to record the price selected against each quantity.

By this method the material is issued at the same price as that at which it was received. In this respect the method is similar to the first one. In addition it provides for a balance of the material actually on hand at any one time as in the second method. For the majority of companies the third method is probably the most suitable, though there are special conditions such as those noted in discussing the other methods which make them sometimes more valuable. By all three methods, however, the same value of the material which is debited to the stores account will be credited thereto when the material is withdrawn.

All three of these methods may be used for worked material with only minor changes. The principal difference is in the way the price of the material coming into the storeroom is obtained. For this material, of course, it is necessary to get the actual cost price from the cost department. Evidently it is impossible to obtain the real cost until after the lot or order is finished. Yet the worked material will actually be turned into the storeroom as soon as it is completed—sometime before there is time enough to figure its cost. Hence,

there is the choice of not entering the material on the records until the cost is obtained or of entering it at an estimated price. The last is usually the method selected and the estimated price is ordinarily chosen as the last actual cost price which is customarily calculated once a month and sent by the cost department to the planning department. The method for handling the discrepancy which must necessarily result is discussed in the following article.

The problem of the correct pricing of the materials has been discussed at some length because experience has shown that this problem is one of the most difficult in actual practice to handle properly. Not only is it important in itself, but it must be remembered that the accuracy of a large portion of the cost accounting records and the reports which are based thereon are dependent on the satisfactory control of the problem. In the following article, the accounting records for the material necessary to complete its control will be discussed.

Cylindrical Nuts

BY ROBERT GRIMSHAW

For many years, since seeing a 250-hp. Bollinckx-Corliss engine in Belgium held down to its masonry by cylindrical nuts, I have wondered why such nuts have not come into their own. They have so much to recommend them from the various points of view of manufacture, application and efficiency.

They may be made of crop ends of shafting—turned, cold-drawn or hot-rolled—or of merchant rod or bar. They may be sawed off, cut off in the ordinary lathe by a parting tool, or machined in the chucking machine. They may be crowned or not though the reason for crowning—the avoidance of trihedral angles, as with hexagon nuts—does not exist and the crowning may be done when parting them. They may be bored and tapped either when made in the turret machine, or after being sawed off, or after parting in the lathe.

They may be put on or taken off by an alligator wrench, if marring is not considered. Otherwise they may be made in several ways for the application of a wrench. They may have one spline, or more, as desired, and the splining may be done either on the single nuts or in the bar, except in the case of the cold-rolled bars, which are apt to curl if only one spline is made. Or, one or more flats may be made—also either on the single pieces or on the bar, and in fact if made in large quantities from cold-drawn stock the die may make the flat. Instead of splines or flat "panes," they may have semi-circular keyways corresponding to a similar key in the wrench. The key may be permanently fastened in the wrench, or not, according to how much room there may be to work in. Of course, the wrench can be made more cheaply by boring or punching than making it for a hex nut by broaching, and socket wrenches are still more advantageously made for round than for hex nuts. Instead of having splines or panes, the nuts may be reeded, and wrenches for such nuts are readily made by broaching.

Where metal around the nuts has to be wiped, they will be found to attract less dirt than the prismatic nuts and to be more readily kept "spick and span."

Finally, they have a larger area of footing on the washer or the workpiece than hex nuts.

Then, why not, cylindrical nuts?

Large Increase in Commodity Production

A very large increase in productive activity is indicated by figures received to date by the Department of Commerce through the Bureau of the Census on January business conditions, with new high records made in many cases.

Cotton goods, pig iron, steel ingots, locomotives, zinc, bituminous coal, and flooring are among the basic commodities whose January production figures show the largest output since the boom period of 1920. Sales and unfilled orders show the same upward trend, especially in metals and building materials. The large car loadings and seasonally high retail sales, as well as the general depletion of manufacturers' stocks, indicate that the goods produced are quickly passing into consumption.

Wholesale prices as a whole showed no change in January but farm products declined, while other groups rose. The present increase in productivity has thus far been differentiated from the 1919 boom by the relatively small expansion of commercial credit and the relatively gradual increase in prices. The price increase during 1922 amounted to less than half of the increase in wholesale prices during 1919.

Cotton consumption by textile mills in January was the third largest in our history, totaling 610,375 bales.

Wool receipts at Boston were very heavy in January, with foreign wool receipts the highest since April, 1921. Silk consumption increased to 34,680 bales, while stocks declined from the December high mark.

Pig-iron production, at 3,229,604 tons, was the largest since October, 1920, while steel-ingot production, at 3,717,071 tons in January has not been exceeded since March, 1920. Unfilled orders of the United States Steel Corporation increased, after two months of decline, and made a high record since February, 1921, at 6,910,776 tons.

Shipments of locomotives from factories were the largest since January, 1921, and unfilled orders were the highest on record at 1,788 locomotives.

Production of zinc rose to 92,634,000 lb., the highest since March, 1920, while stocks declined to 33,148,000 lb., the lowest since the armistice.

Production of bituminous coal in January amounted to 50,123,000 tons, the highest month, with one exception, since December, 1920.

Lumber figures for January, as far as available, indicate a considerable increase in production and shipments over both the previous month and the corresponding month last year. Production of maple flooring reached the highest point on record, and oak-flooring production for January has been exceeded only once.

Melting of Sponge Iron

The study of the melting of sponge iron to produce foundry iron will be continued at the Northwest Experiment Station of the Bureau of Mines, Seattle, Wash. The carburization studies conducted on a laboratory scale during the past year will be continued on a commercial scale, using some of the local commercial electric furnaces and foundry cupolas. A study of the mechanism of carburization and of the causes of graphitization will be conducted in the laboratory. After the above studies have been completed, the conditions determined will be applied to the melting of sponge iron.

Automotive Service Methods and Equipment

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

XV. Development of specialized service tools—Repairs on cylinders, pistons and valves—Inspection tools and methods—Cost and car-check systems

AN INCREASING demand for speed and efficiency in the matter of repairing motor cars has prompted the invention of a number of tools especially designed for certain operations, and combining a maximum of efficiency with a minimum of chance for error. Several such tools are included in the equipment of the Franklin Motor Car Co.'s Detroit service plant.

The fixture shown in Fig. 1 is used for boring the main bearings in a Franklin crankcase. This tool was designed by Franklin engineers and is intended to become a part of the standard equipment of every Franklin service station. The crank case is attached to the under side of the fixture by four bolts *A*. Each of these bolts passes through an adjusting nut, which makes it possible to locate the case correctly for height and then anchor it securely. As a boring bar has a short travel, one bearing only is bored at a time, necessitating places in the bar for seven tools—one for each bearing. As soon as a bearing is bored, one of the split bushings shown on the bench in front of the fixture is slipped into the bearing and helps to guide the bar in boring the next bearing. When the case is in place for boring, the guide bushing *B*, is slipped into the front end of the fixture and the bar inserted. The guide bushing is held from turning by a small pin. A 10-pitch square thread is cut on the end of the boring bar, and fitted to this thread is a knurled nut *C*. A tongue on the end of the collar fits into a corresponding groove in the end of the guide bushing and when thus joined forms the feeding mechanism for the bar. The bar is turned by hand, each turn feeding it a distance equal to the lead of the screw.

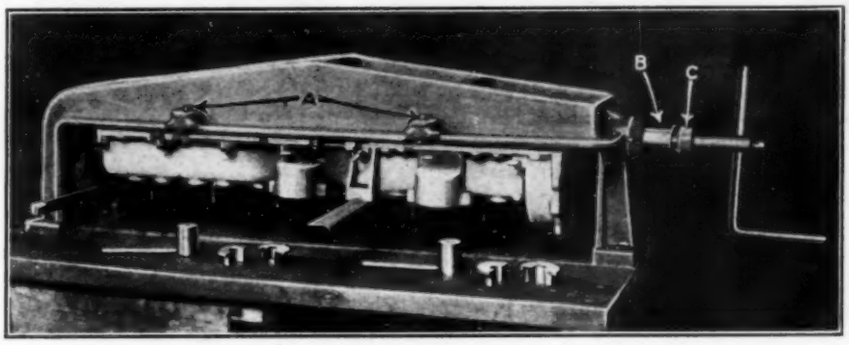


FIG. 1—FIXTURE FOR BORING CRANKCASE MAIN BEARINGS

A connecting-rod reaming fixture is shown at the left in Fig. 2. The reamer bar is fitted with bushings and the cutters, of which two are shown in the illustration, are pinned to the bar. The fixture will accommodate rods of different lengths, this being accomplished by having the member that holds the small end of the rod hinged so that it will adjust itself.

On the same bench with the connecting-rod fixture is a magnetizer for magneto magnets. It is made of two steel blocks, each containing an electric coil. The magnet, which is shaped like a horse-shoe, is placed with the ends in the slots *A*, and the current is turned on. The results are almost instantaneous.

GRINDING VALVES

The operator shown in Fig. 3 is grinding a valve in a Parker grinding, drilling and turning machine. The machine is entirely self-contained, being driven by a ¼-hp. Westinghouse motor. Any ordinary valve can be ground in this machine in an average time of one minute, after the grinding wheel has been set at the desired angle, and this can be done almost instantly. The plate to which the motor is attached and the journal for the grinding wheel spindle are made in one unit, so that the spindle can be set at any angle from vertical to horizontal. A drill chuck, milling cutter or turning tool can be attached to the spindle if desired, making it possible to perform all sorts of small operations. The speed of the wheel shown in the illustration

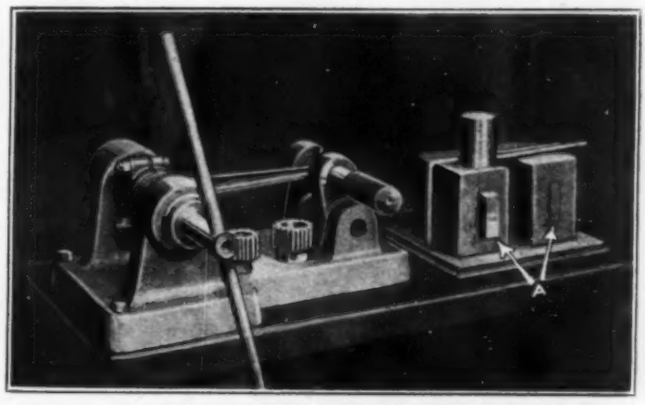


FIG. 2—CONNECTING ROD REAMING FIXTURE AND MAGNETO MAGNETIZER

is 7,500 r.p.m., and the valve, 400 r.p.m. The chuck is adjusted for position by means of cross and vertical feeds, and the wheel is fed past the work by hand, as shown.

The operation shown in Fig. 4 is that of stoning a cylinder, using the tool shown at *A* in Fig. 5. The body of the tool is aluminum, eight inches long and slightly smaller than the cylinder bore. It has four slots, each ⅛ in. square, for carrying four oil-stones

FIG. 3—GRINDING A VALVE SEAT

similar to the one shown in front of the tool on the bench. Four springs under each stone tend to hold it tightly against the cylinder wall, and the rapidity with which a scored cylinder can be repaired is remarkable. This tool is manufactured by the Accurate Tool Co., Detroit Michigan.

FIG. 4—STONING OUT A CYLINDER

The tool *B*, in Fig. 5, is a Vedoe-Peterson piston-groove cleaner, in position for cleaning the grooves in a piston. This tool will clean the carbon from the grooves of a piston in much less time than would be required by hand scraping and does a much better job. The piston to be cleaned is held in a small vise, as shown, or on a bar pressed through the piston pin hole and clamped in a vise. The hinge in the frame of the

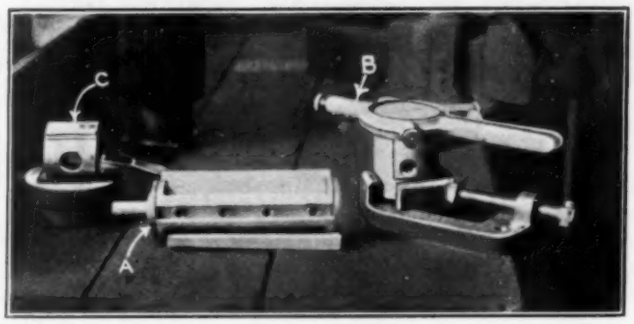


FIG. 5—(a) STONING TOOL, (b) PISTON-GROOVE CLEANER. (c) WALKER MICROGAGE

holder allows the tool to be opened so that it can be placed over the piston with the cutters resting in the ring grooves. The three cutters can be adjusted to the approximate depth of the groove by means of adjusting screws, one behind each cutter and then locked in place by means of small set screws. The knurled screw that holds the two parts of the handle together provides the final adjustment. The carbon or other matter is cleaned out of the groove by rotating the tool around the piston.

Inspection of Cylinders

The tool shown at *C*, Fig. 5, is a Walker microgage, used for testing the size and concentricity of cylinders and its operation can be seen in Fig. 6. It consists of an aluminum frame carrying contact points connected to a dial indicator. A handle is attached to the frame so that it can be moved to any desired position in the cylinder bore. As the dial faces the operator, any variation in the diameter of the bore can be noted at once. A steel ring, or "setting block," of the correct bore diameter, is used for setting the indicator.

The cylinder shown in Fig. 7 has been connected with the air-line and is about to be inspected for leaks. The vertical air pipe under the bench is screwed into a square plate which is bolted to the bench, and the cylinder is bolted to the plate in the position shown. A gasket between the plate and the face of the cylinder prevents the escape of air. A small amount of oil is poured into the port and the air turned on. If the cylinder leaks, the oil will form bubbles at the leaky place, affording a quick method of detection.

A Canedy-Otto connecting rod and piston aligning-

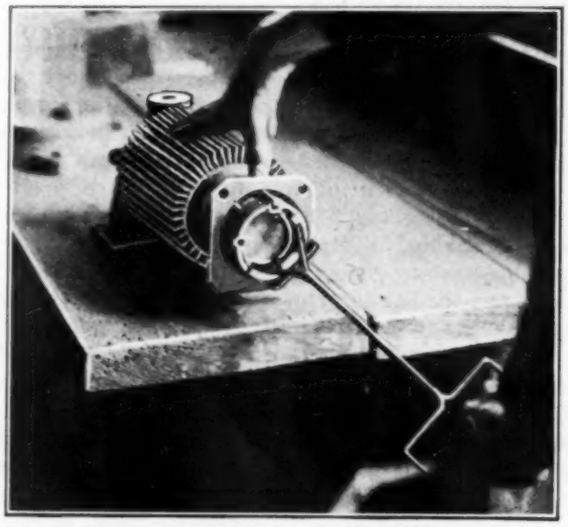
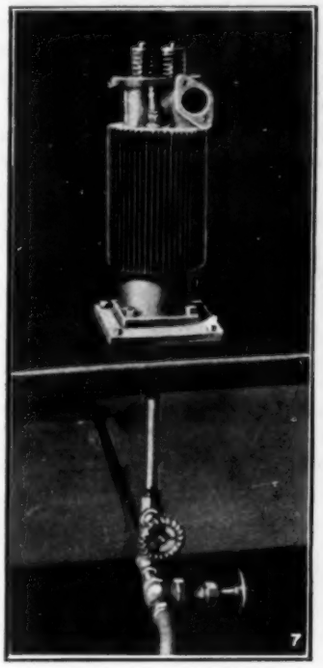


FIG. 6—INSPECTING A CYLINDER

gage is shown in Fig. 8. The face of the gage, which is ground and scraped to a plane surface, is square with the pin over which the large end of the connecting rod is passed. If the piston is not square with the hole in the large end of the connecting rod, the error can be instantly detected.

Measuring the Gasoline Flow

A Penberthy "Flometer" of the portable type is shown attached to the side of a car, in Fig. 9. The gasoline passes through this device, on its way to the cylinders, and is registered on the face of the meter in gallons per hour. The rear end of the car is jacked up, the clutch thrown in, and the speed of the car calculated from the r.p.m. of the rear wheels. Thus the amount of fuel consumed per mile, or the mileage per gallon of fuel, can be positively known. Every car gets this test before it is allowed to leave the shop, so that any defect that might tend to increase the amount of fuel used can be discovered and remedied.



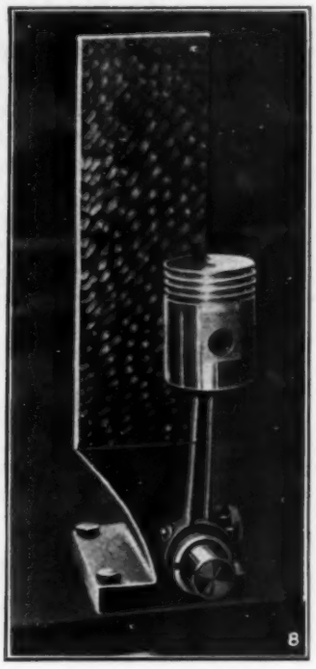


FIG. 7—TESTING FOR LEAKS. FIG. 8—CONNECTING ROD TEST GAGE

When a car comes into the shop for repairs it is immediately given an order number and a work ticket is made out for it. When a workman starts work on a car, he registers on the ticket the time started and hangs the ticket under his name on the board shown in Fig. 10. The foreman, by referring to this board, can instantly learn what cars are in process, and what job each man is working on at any time.

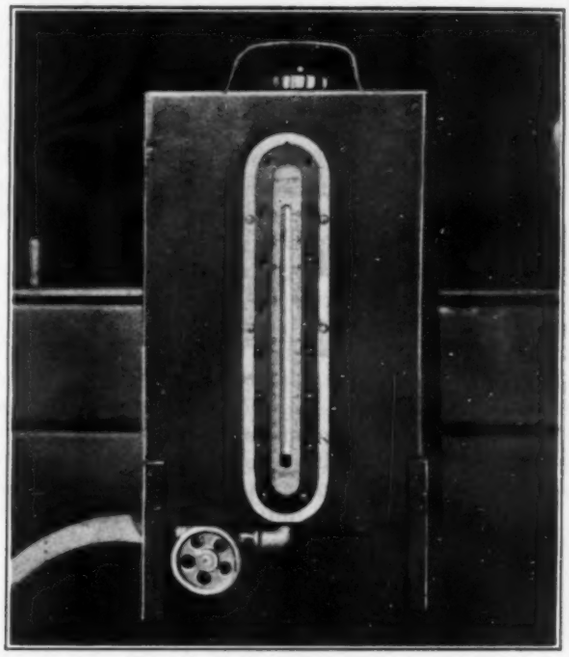
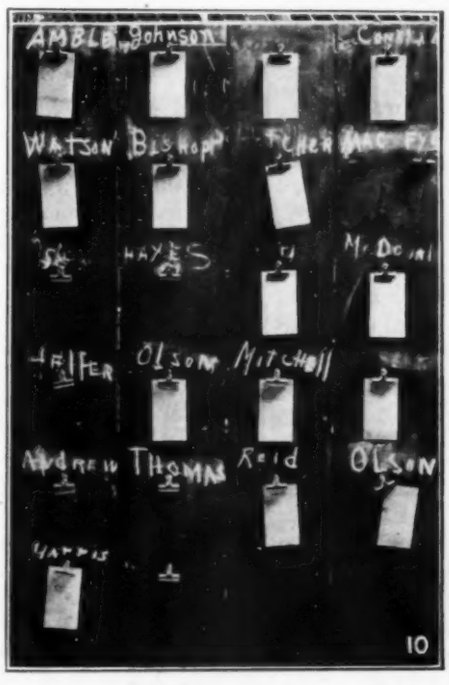


FIG. 9—PENBERTHY FLOMETER

In the meantime, a clerk has marked the order number, name of the owner, time the car came into the shop and time wanted, on the blackboard shown in Fig. 11. If the owner's name is unknown, the make of the car is used instead. When the work has been completed, the workman makes a check mark in the column marked "check." As soon as a check mark appears on the board, the inspector examines the work done, and if found satisfactory, he signs his name in the last column and hangs an O.K. tag on the car. The status of any car can be determined by a glance at the blackboard.

A control board is not only a great convenience, but almost a necessity if a foreman is to keep posted on the progress of the work and to be able to apportion the jobs to the best advantage. It is a real time-saver.



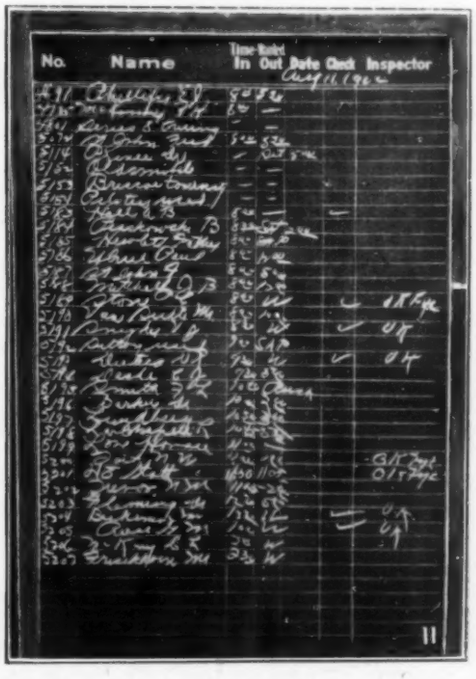


FIG. 10—WORK-TICKET BOARD. FIG. 11—REGISTER OF CARS

The Millwright

By George Walter
In Charge of Maintenance, Millholland Machine Co., Indianapolis, Ind.

DURING THE PAST decade there has appeared in the majority of machine shops in this country a sort of repair man or maintenance man known as a "millwright." The name millwright may be found in Webster's International to be a man who builds a mill, and up to this new period his duties entailed just this kind of work. The millwright used to be a carpenter, a tinner and a man who had to be able to set up machinery. He had to be able to do anything a carpenter could do, and yet a carpenter could not qualify as a millwright. He was usually employed by a firm engaged in the manufacture of mill equipment and was sent from place to place by this company to install its equipment. In comparison he was similar to the "road man" of today.

Duties of Millwright

Gradually mill owners came to realize the need of a man to maintain machinery after it had been installed. This man we know as the present day millwright. He is maintained not by the company manufacturing the machinery, but by the company operating it, and his duties cover a wide field.

Should the superintendent want a machine moved from one end of the shop to another, he calls upon the millwright. The millwright moves the machine, lines it up with the lineshaft, sets the countershaft, puts on the belts and, in short, places the machine in commission in its new location. If the roof leaks, it is the millwright's business to repair it. If a belt breaks, he mends it. Many small shops have even found it possible to dispense with the electrician and call for a "millwright, handy with electrical equipment."

Less knowledge is required of the present day millwright and a great deal more manual labor. His wage has dropped correspondingly. The millwright, once one of the highest paid mechanics in the country, can now be secured at a rate far below that of an ordinary machinist. Nevertheless, there is a great field for a man in this line of work if he has the pep, ambition and brains to make his job a little better than it was when he acquired it. How many millwrights bother to take measurements when setting machines. Generally they stand back in the shop and squint one eye while another man shoves the machine around with a crowbar. When he gets it where it looks to be in position, he lags it down. If the belt runs off he cuts the splice on an angle and makes it stay on. The fact that such a belt is pulling on one edge while the other is running slack does not worry him, and when the belt wears out ahead of schedule he decides it was made "during the war."

Experience Offered in Millwright Work

Why should it be necessary for the engineering department to figure out the sizes of pulleys required to drive a machine at a given speed when the speed of the line-shaft and the size of the pulleys on the countershaft and on the machine are known to the millwright? A few hours study in spare time, and any man with a common school education and a little mechanical ability should be able to learn the method of working out this problem without the aid of a highly paid expert.

Why should he not learn the elements of machine operation so as to be able to do a simple job of bushing on an idle lathe without calling upon the shop superintendent and so interfere with production? A fit job without extreme accuracy is wanted, and a set of calipers will do the measuring very nicely if the man is not familiar with the reading of a micrometer.

What harm can it do for a millwright to take an interest in the electrical motors in his shop? Or learn all he can about their construction and maintenance? Why shouldn't he learn the right and wrong way to renew a fuse? How many millwrights know how the back-gears of a milling machine operate? Why shouldn't a millwright be able to renew a broken window pane with neatness and dispatch so that it would not attract attention when visitors are around the shop? A pipe wrench is not expensive, and a small shop can better afford to purchase a set of dies and taps than to employ a pipe fitter regularly or call a high priced man in from the outside to repair a leak in a drinking fountain.

Most companies are ready and willing to pay such an all-around man a little more than an average millwright has any right to expect. There are shops where the millwright is getting upwards of a dollar an hour and there are others where he is getting thirty cents. The men themselves are to blame for this condition.

There are millwrights who have become maintenance superintendents at high salaries. Why not? They have a better opportunity than either the electrician, the machine repair man or the carpenter to learn all there is to learn about maintenance work. The time is bound to come when a general maintenance man will be a necessity to every shop, and the best training a man can have for this position is actual experience.

Side Jobs Help Small Shops

By Frank V. Faulhaber

The addition of side-lines enables some machine shops to operate more profitably, particularly during such times when orders fall off. Often we find, in the case of the smaller shop notably, that not enough work is on hand for the toolmaking department, with the result that certain help is laid off, an action to be later regretted. The object, of course, is to maintain the working forces intact so far as possible without operating at a loss. One plant has hit upon a good idea here that may suggest a way out for others.

The plant is of small proportions and turns out a lot of metal specialties. Usually there is not enough work on hand for the one toolmaker. During busy times there is an assistant, or perhaps two, and particularly then is the plant operating to advantage. Reflecting over this, the department head pondered the question of extra work from outside previously never undertaken. The boss was receptive to his suggestion, with the result that orders are now regularly taken for machine dies from neighboring firms who have not the facilities to do this work, and but small call for it.

As a result of the preceding events the tool-shop is now rather busy. There are no slow periods and every minute is used to advantage. There is also an automobile shop in the community for which the machine plant now turns out occasional work. The larger plants may not want to bother with this particular feature, but it is well worth considering in the case of the small shops. There is always a lot of work on the side to be had, which can be attracted easily enough.

Design and Construction of Large Machine Tools

BY GEORGE H. BENZON, JR.
Engineer, Wm. Sellers & Co., Inc., Philadelphia, Pa.

Limitations imposed on design by materials and available shop equipment — Problems involved in the design and construction of large boring mills and planers

THE SUBJECT covered by the above title, as generally understood is a very broad one. In fact, it covers two somewhat different types of machines commonly classed under the general title. There are machines which are used for accurate cutting and finishing; these belong distinctly in the machine-tool class. There are also those which are used for metal working other than finishing. The first-mentioned class, however, will be the one made the subject of this discussion.

It is obvious and natural that the demand for large tools diminishes as the sizes of the tools increase. Developments of large mechanical and electrical projects of continually increasing size must include consideration of the means of production, and involve in many cases installations of large machine tools to accomplish the ends desired. The development of one such project frequently raises the general requirements in the particular industry to which it belongs and incites competing development. The requirement for these tools is very irregular. Some lines lie dormant for a long time, during which others are very active, and then the active ones drop out entirely for a period and others take their place. There are also times when the saturation point is temporarily reached, during which the whole market is dead.

PROBLEMS OF DESIGN

Machinery for building in the most efficient way the ever-increasing sizes of tools the market demands, would involve an investment far in excess of that which would predicate an equitable return. The machine-tool builder therefore in many instances has to use average large-shop equipment to produce tools of a larger size than any he has in his establishment. This condition requires considerable attention from the designer, who must plan the large units of the machine so that they may be handled by existing equipment and at the same time not suffer in their value as a part of the big machine tool.

Large patterns are bulky in storage and expensive in maintenance to such an extent that in many cases the designer must try to adapt them to a variety of uses. It frequently pays to make a mold from a larger pattern and to stop it off with cores, rather than make a new pattern for the job. The time required to make new large patterns for a machine might affect delivery dates seriously and cause the loss of sales. The designer must bear all of this in mind, and also consider the feasibility and desirability of compromise in shaping the large units.

Another factor entering into the design and construction is the limiting sizes of parts that can be conveniently shipped. Bridge and tunnel clearances on the railroads limit the dimensions of parts that can be

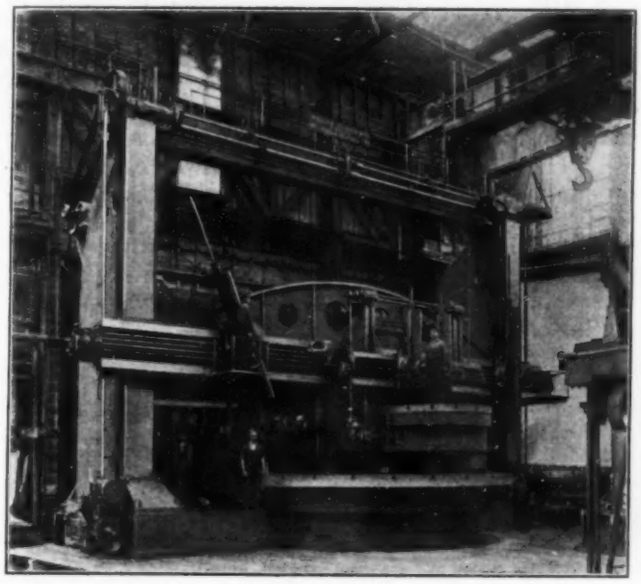


FIG. 1—LARGE BORING AND TURNING MILL

shipped as a unit. Machine tools must be made so that after having been assembled, tested, and corrected where necessary to an accuracy seldom matched in other mechanisms, they may be taken down, shipped, reassembled, and reproduce after these operations the same degree of accuracy as when under test.

The quality of machine tools for finishing is dependent on sound design backed up by expert foundry and machine work; and all of these factors must rest on the foundation of experience. Detailed planning and instruction can rarely be applied in such work, and therefore the individual experience of the men, as well as of the foremen, has an appreciable effect on the character of work produced.

In the drafting room there must be a thorough knowl-

Abstracted from a paper presented at a joint meeting of the Philadelphia Local Section and the Machine Shop Division of the American Society of Mechanical Engineers, the Engineers' Club of Philadelphia, and the Philadelphia Section of the American Institute of Electrical Engineers at Philadelphia, Feb. 27, 1923.

edge of shop conditions, shipping conditions, and of the difficulties encountered in previous experience in building the big machines. In the pattern shop and foundry there must be knowledge of the action of the molten metal in cooling, which will enable the patternmaker and the foundryman to gage with some degree of certainty the eccentricities of the metal in large castings

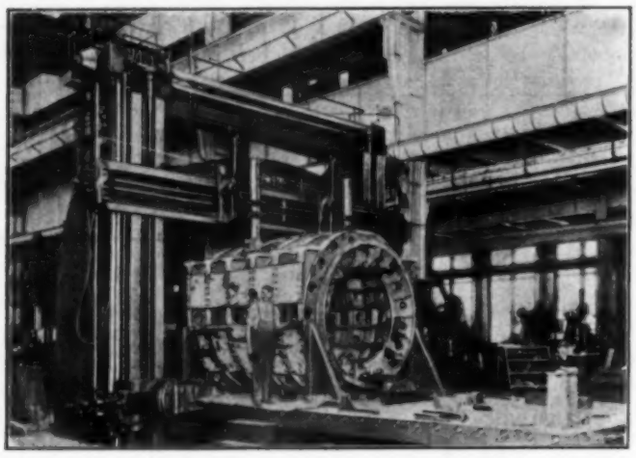


FIG. 2—LARGE PLANER FOR ELECTRICAL WORK

so that those delivered to the machine shop will be sound.

A large casting must be designed so that as far as possible the various sections will balance each other in cooling. Lack of balance in a long casting, for instance, if not properly compensated, will cause it to distort in cooling, often to such an extent that the amount of finish allowed in the pattern shop is of no use. There are some cases, however, where it is necessary to use unbalanced sections. In these cases experience teaches how much the mold should be distorted to offset the natural tendency of the casting. Interrupted flow of metal in pouring a large casting may, in fact will, if it occurs, detract from the value of the casting.

Limitations Caused by Material

In order to produce a good close-grained material on the wearing surfaces of the machine, it has been found desirable and practical, using a high-silicon iron, to cool these surfaces quickly by casting them against chill blocks. The metal produced in this way is not what is known commercially as chilled iron. While it is common knowledge that this method is desirable and practical, some years of experience as to size of chills and analysis of metal are essential in the making of large castings in order that satisfactory and consistent results may be obtained.

In the machine shop the castings must be properly handled to produce accuracy. All castings as they come from the foundry contain a great number of internal stresses. When some of these stresses are released in machining, others that they have been balancing are also released and produce distortion. It is therefore necessary that these large castings should be rough-machined in the proper sequence of operations and that enough time between be given for the stresses to work themselves out before final conditioning.

One of the disturbing factors in the construction of large machine tools is the variation in temperature between night and day and between floor temperatures and temperatures which exist at a height of, say, 25 ft. above the floor. For instance, in testing the alignment of the housings or uprights on large machine tools, variation in temperature will cause uprights to move from one side of a plumb line to the other in comparatively short time.

The main bearings on large machine tools must be accurately fitted. To do this conveniently, where possible the bearings are capped and bushed and each bearing scraped to fit its individual shaft. A properly designed bearing, if improperly fitted during erection, may in a very short time of running develop such trouble that the design of the bearing may be questioned and throw discredit on the machine performance.

All of the main bearings in high-grade machine tools are bushed in order that (1) the best possible kind of metal may be provided for the bearing surface, and so that (2) in case of accidental cutting or scarring or wearing in service the bearing may be renewed by replacing an old bushing with a new one.

The Boring and Turning Mill

A detailed discussion of design and construction as applied to any one tool, to be complete, would take up more space than is available for all of this paper. However, one or two specific cases may be taken to illustrate some of the outstanding points.

Fig. 1 will give an idea of the proportions of a large boring and turning mill. To appreciate the size, comparison may be made with the medium-sized boring mill set on the work table of the large mill. The small mill shown swings 100 in. between the uprights or housings; the large mill swings 35 ft. and has a maximum clearance between the work table and the underside of tool heads of 18 ft. The rams at whose lower ends the cutting tools are carried have a stroke of 7 ft. The weights of some of the large castings are as follows: bed, 98,000 lb.; table, 73,000 lb.; crosshead bar, 66,000 lb.; total weight of machine, 429,200 pounds.

The main problems confronting the designer in this

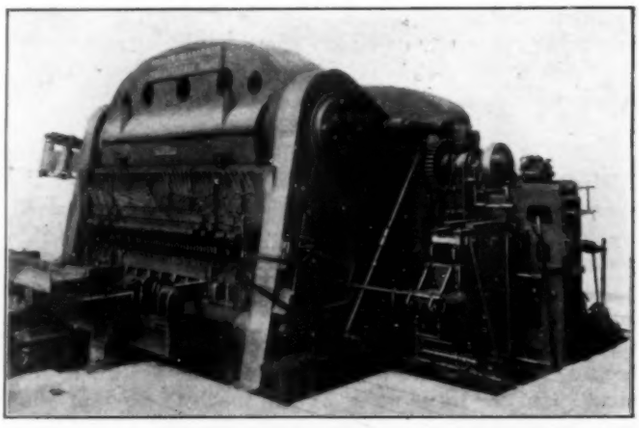


FIG. 3—MULTIPLE PUNCHING MACHINE, OPERATED AUTOMATICALLY FROM A PUNCHED PAPER TEMPLET

instance were that the machine was to carry on the table work weighing up to 75 tons, bore a true hole 7 ft. long, and face and turn accurately. The accuracy required in the bore will probably not permit over 0.002 in. variation in round or in parallel in the length of 7 ft. To obtain the requisite accuracy the guides on the crossrail on which the tool heads move must be very close to a perfect parallel to the annular bearing surface

on top of the bed. Obviously the tendency of a beam suspended on screws 36 ft. from center to center is to deflect somewhat, due to its own weight and the weight of the tool heads. To remove the sag in the crossrail, a separate casting in the form of an arched girder is bolted to the top of the crosshead bar. The arched girder is mounted between a solid abutment at one end of the crosshead and a wedge abutment at the other. Both abutments are on the crossrail and in a vertical plane as near to the front edge of the crossrail as permissible. By adjusting the wedge at one end of the arched girder it is compressed between the abutments on the crossrail, thereby putting enough stress into the arched girder to deflect it and the crossrail upward sufficiently to straighten the crossrail and remove the initial deflection.

Another problem confronting the designer is that of supporting the cutting tool in a sufficiently rigid manner to take reasonably heavy boring cuts when the tool is extended, say, 7 ft. to 10 ft. below the bearing. This puts a bending as well as a twisting strain upon the tool bar, and a twisting and bending strain upon the crossrail. To resist these forces in the crossrail, the rail is made of a box construction. In the machine shown this box is a continuous section the full distance between the two uprights and is clamped at the back edge of this extended section to the uprights, at both sides.

The Large Planer

In Fig. 2 is shown a large planer erected in the shops of one of the large electrical manufacturing companies. A conception of the proportions of this machine can be formed by comparison with its surroundings and with the height of the workman standing on the table. It is made with a table to plane work 36 ft. long. The over-all length of the bed is 65 ft. 8 in. The clearance between the housings is 16 ft. 2 in. and the distance from the table to the underside of the crossrail is 13 ft. 4 in. These figures fix the limits for the size of the work that can be handled on it. The bed weighs 123,400 lb. and the table (38 ft. 6 in. long) 151,000 lb., the total weight of the machine being 412,340 lb.

On a machine of this type the outstanding considerations are as follows: It must be so constructed that it will produce flat and parallel surfaces throughout its complete working range. The parallel accuracy is of course controlled to a great extent by the foundations upon which the machine is installed. Where accurate work is required from a planer, the bed should be tested, for level and straight, at short periods, for some time after installation and thereafter at such periods as may be indicated by the character of the output of the machine. In the builder's shop, however, the machine must be set up so that it will plane flat and parallel within extreme limits of a few thousandths of an inch.

Problems of Large Planer

The same problem confronts the designer in this case as in that of the boring mill, namely, the design and construction of the rail on which the planing toolholders are carried. As the planers so far built have not reached the width between the uprights required on boring mills, it has not been necessary to make the crossrails of as heavy a section as on the boring mills; but the same considerations, on a reduced scale, indicate the desirability of the use of the arched girder to eliminate the initial deflection of the rail. Another feature of great importance is the question of adequate mechanism whereby the heavy table, and heavy work carried on the table, may be reciprocated at desirable speeds. The planing machine cuts in one direction. The return stroke of the platen and work is therefore lost time, and must be reduced to the smallest possible amount in efficient production.

In the planer in particular, the designers and builders have to thank the electrical engineers for the best solution, so far, of the problem of reversing driving means. A reversing motor having direct connection to the driving gear of the planer has been developed in capacities up to 75 hp. and both it and the control have been found to stand up successfully under the strain of continuous reversal.

Compressed air is used for some of the operations which in the smaller and earlier machine tools were performed manually. A notable instance of this is found in these same large boring and turning mills and planers. Rigidity is essential to the satisfactory performance in cutting and the crossrail of a mill or planer must be firmly clamped in position during the cutting operation. For this purpose adequate clamps are provided to the inside and outside of the housings. When it is desired to change the distance between the platen or work table and the crossrail, these clamping bolts must be released, and tightened again after setting. On a high, wide machine these bolts are in inconvenient positions for the operator to reach. To obviate this, pneumatic clamping devices are arranged so that a machinist from a position on the floor can, by moving a small air valve, control either of the required operations.

Boring mills and planers have been selected from which to draw the examples given, as being the two outstanding largest types of surface-finishing machine tools constructed up to the present time. Indications are that still larger planers and boring mills will be built in the near future than have been built before. There will shortly be in the market inquiry for a planer to plane 20 ft. between the housings, and a boring mill to swing 40 ft. between the uprights.

There are other large machine tools, such as the multiple punching machine illustrated in Fig. 3, in which developments of equal importance to those mentioned have taken place, and their design and construction offer many interesting problems.

Men Apply for Boys' Jobs

By A. W. Forbes

A number of my articles have appeared in the *American Machinist* stating the opportunities for young boys in the industries and particularly in my shop. As a result of these articles a number of men have applied for work, but not a single boy under 17 years of age has stated that he was in any way influenced in applying by seeing anything in the *American Machinist*.

If an article in your paper mentioned an opportunity for old men, do you suppose the boys would apply? Or possibly your readers do not have sons for whom they wish to give the same opportunities that they want for themselves.

It would not be strange if persons disagreed with me and did nothing, but what puzzles me is why a father who hears of something recommended for a boy, applies for it himself instead of for his son.

Reducing Costs and Increasing Production

By M. G. Cochran
Toronto, Canada

IT IS surprising how easy the solution of a manufacturing problem can be, once you put your mind to it, and yet how often a certain operation is allowed to exist simply because it has been done that way for several years.

Unfortunately, the tendency is to let well enough

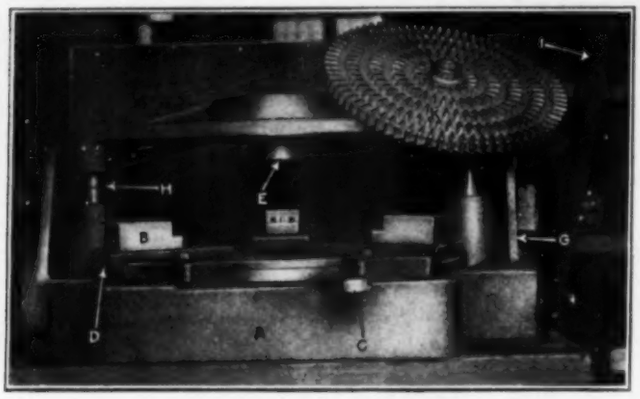


FIG. 1—THE OLD TYPE JIG

alone. "We are getting out all we require" is a rather common statement when improvement is suggested, yet this is the wrong attitude to take.

Many a foreman has been proud of his existing jigs and fixtures, yet suddenly he sees a new idea, applies it to his own work, thereby increasing production and

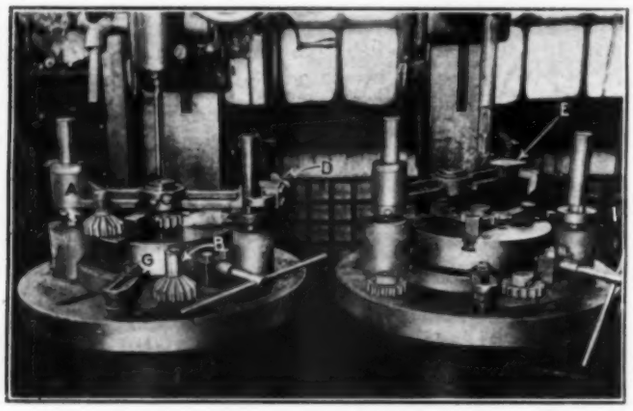


FIG. 2—THE NEW TYPE JIG

saving thousands of dollars yearly. I remember clearly one such incident.

For over five years the type of snapper jig shown in Fig. 1 had been applied to fixtures for over 200 parts in the factory and, as the plant in question was a very large one making agricultural machinery, the decision to adopt this style of jib was a very important one. These jigs proved very successful, operated smoothly, increased production and satisfied even the production manager.

Briefly, here is a description of their construction and operation: *A* is the base, *B* the chuck jaws (usually three) operated simultaneously by the handle *C*. *D* represents the ways in which chuck jaws slide.

FIG. 3—A CONVEYOR THAT SAVED MONEY

E is a centering cup which comes down on the top boss of the work. *G* shows the sort of toggle or snapper-movement lever from which the jig got its name. *H* shows one of the two guide pins, which have springs attached at the bottom.

In action, the operator pulls the handle *I* until the toggle comes to the dead center, thus holding the top part of the jig up, while work *K* is placed in the chuck jaws. Next the lever is released, the top member snapped into place and the work quickly held. For five years no further improvement was thought of.

An apprentice draftsman threw a bomb into camp by remarking to the foreman one day that "Those snapper jigs were too slow." Without trying to picture the scene, it is enough to say the foreman decided the lad was crazy. Later, this enthusiastic tyro decided to take his pet idea higher up, where, of course, he should have taken it in the first place.

The chief told the boy to go to it and show him, with the result that the jig shown in Fig. 2 came into being. At first the chief was very cautious. "If we decide to adopt this idea it means the scrapping of over 200 jigs" he said, "therefore we must give this new jig a thorough trial." The trial showed that in less than a month the added production more than paid for the cost of the new jig and all the experimental work. Immediately orders were issued for a general change and now all jigs for such work are built as shown in Fig. 2, and operate as described in the following several paragraphs:

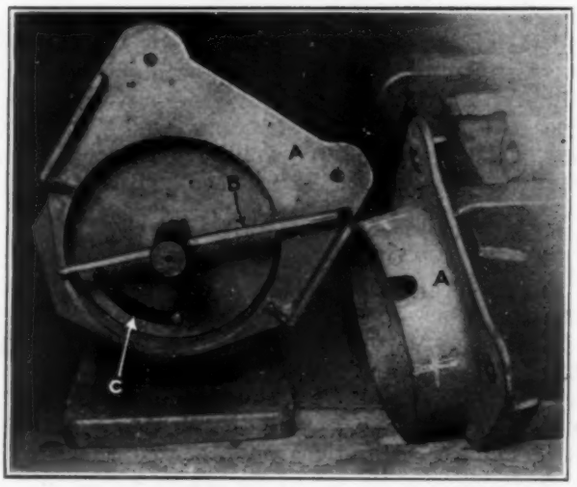


FIG. 4—TWO INDEXING JIGS

A universal chuck is mounted centrally on the regular drilling machine table. *A* is a swinging arm, in which is a centralizing bushing at *C*. *D* is a quick action spring latch shown open at *E*. *G* designates the chuck and *B* the work in one case. Note that two styles of gears are being drilled alongside of each other, yet the equipment is standard. With this style of jig, one operator can easily attend to three or four machines without difficulty. Thousands of dollars have been saved since the change from the old style, as greater accuracy is secured on the later type.

Another case where a simple change resulted in added production is shown in Fig. 3. The piston line in this plant was arranged rather nicely, but passing the work from one machine to another by means of tote boxes was very unsatisfactory, yet for want of a better method, or lack of initiative, it sufficed for over a year. The simple conveyor shown was then evolved and since its adoption there has been less damaged work and considerable added production.

The castings shown at *A*, Fig. 4, used to cause trouble, but for some reason or other the management

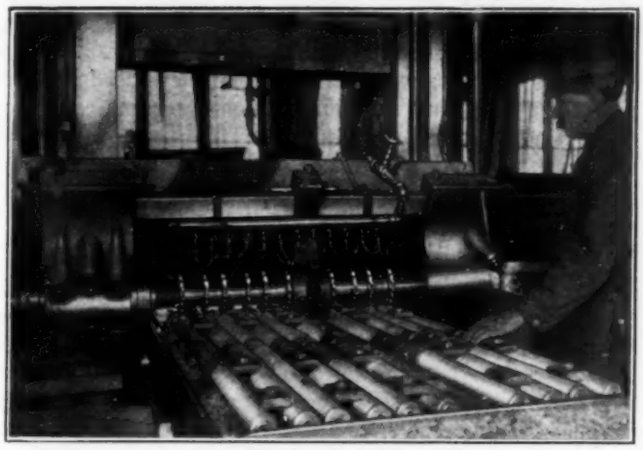


FIG. 5—MILLING TEN KEYWAYS AT ONCE

was content to drill the holes marked by chalk crosses in two settings. This went on for over a year, then a junior designer developed the fixture shown which operates as follows:

The wedge *B* holds the work in place over a pilot which corresponds to the inside diameter of part *A*. The position of the two holes is determined by means of the pin and slot at *C*. The operator merely revolves the central spindle of the fixture to either extreme of slot. The drill bushing is on a standard hidden by the flange of the casting.

The last illustration, Fig. 5, shows how ten keyways are cut out at once, where previously one was cut at a time on an ordinary milling machine. Granted that the former method was poor practice, yet it went on for over a year, before it was decided to purchase a machine suitable for the work.

The next thing was to have some simple and quick method of holding the work. By arranging clamps as shown, each to grip two shafts, good production was secured. Each clamp has tapered edges which help to pull the shafts down firmly onto the V-blocks on the bed of the fixture.

The examples which have been shown could be duplicated many times over, but the moral is plan, viz.: "Never let up," irrespective of the fixture you may at present be using. Keep your eyes open constantly. Interchange of ideas is a splendid thing and it is in the columns of the technical press that many hints can be discovered. Quite suddenly up may pop the very idea you require. It may be applied to another type of fixture on other work, but the fundamental principle is the main thing. Get the habit of studying the other fellow's problems as well as your own, for in so doing you may run across the very idea that will help you in your own particular business.

Simplification in the Clock Industry

That there are advantages to simplification by limiting the number of styles in a complicated industry, such as that of clock making, where the personal opinion and taste of the consumer play a large part in determining style, is indicated by the following letter. It was written by the William L. Gilbert Clock Co., Winsted, Conn., and issued by the U. S. Chamber of Commerce.

"Up to six or seven years ago, this company had carried a very large line of clocks of all kinds and descriptions, many of the patterns being but slight changes from others. This had grown through a course of years owing to the trade's and the salesmen's demanding something new every few months, until it reached the point where it was next to impossible to carry a complete line, and even when a partial stock was carried, it tied up a large amount of money.

"We then analyzed the sales of the various patterns and arbitrarily cut out the 'duds,' keeping only such patterns as had apparently been sold in quantities sufficient to keep them alive. We kept checking up on these patterns so that when we found the interest in any one particular number lagging, it was quickly dropped, and if it seemed necessary, some good live or new design was put in its place with the result that from having a list of patterns of various items running from four to five hundred pieces, we now have a line that runs under seventy-five pieces.

"While we still have the demand from some of our customers and from our salesmen for different clocks and continually new patterns, we have found the reduced number of patterns has not only enabled us to produce more economically and make shipments in a more satisfactory manner to our customers, but also to make some real progress.

"We do not have so much money tied up and dead in large inventory, so that if business conditions offer the least possible chance of making a moderate profit, we can do so and not find that we have tied up everything in a tremendous inventory of numerous items, more than half of which cannot be sold in sufficiently large quantities to ever make it a profitable proposition."

Factors Affecting Contraction of Alloys

The most important factors affecting the contraction of a non-ferrous alloy, on casting, include (1) chemical composition of the alloy; (2) pouring temperature; (3) cross section of the bar poured; (4) length of the bar in relation to its cross section; (5) character of the mold, and the method of molding; (6) gas occlusion, and overheating of the melt. These factors are discussed briefly in Serial 2410, "Contraction and shrinkage of non-ferrous alloys as related to casting practice," Bureau of Mines, Washington, D. C.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Magnifying Glass for Filing Machine

BY GEORGE ALLEN

An eye saver is shown in the illustration. It is a six inch reading glass adjustably mounted on a cast iron base. It cost very little but no amount of money could induce the toolmakers to do without it. One cannot realize how much easier it is to do exact filing with

FILING MACHINE EQUIPPED WITH MAGNIFYING GLASS

the aid of this device until he tries it. With a good glass the scribed line looks almost big enough to walk on and any unevenness looks like hills or valleys in the landscape. Just rig up one and see if I am not right.

Placing Limits on Drawings

BY EDWARD HELLER

Regarding placing limits on drawings it might be interesting to note here of a method that was used in a shop in New York where the writer was employed for a time. Each drawing carried the following note:

Limits on common fractional dimensions					+	$\frac{1}{64}$		
"	" decimal fractions			thus	0.5	or	$0.12\underline{5}$	$\pm$ 0.010
"	"	"	"	"	0.50	or	$0.12\underline{5}$	$\pm$ 0.005
"	"	"	"	"	0.500	or	$0.12\overline{5}$	$\pm$ 0.001
"	"	"	"	"	0.5000	or	0.1250	$\pm$ 0.0005

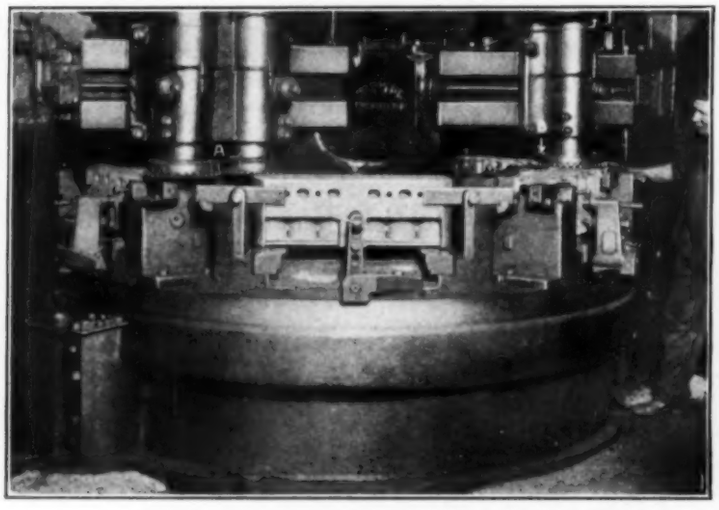
Any limits that were not included in the above list were placed directly at the dimension involved.

The above limits were the kind that were used in that particular shop, but, of course, such a scheme could be worked out for any other set of limits.

Two Interesting Cylinder Operations

BY HERBERT CRAWFORD

The Pierce-Arrow Motor Car Company has adopted continuous milling operations for the tops and bottoms of its cylinder blocks, the large Newton milling machine shown in Fig. 1, being used for both rough and finish milling at the same setting. The roughing work is divided between the two milling cutters at *A*, while the large single milling cutter shown at *B* takes the finishing cut. An allowance of 0.022 in. is made for a cylinder grinding operation. This illustration gives a good idea of the type of fixture used and also shows the loading station at the front. The table turns to the left and as soon as the cylinder block comes out from under the finishing cutter *B*, it is removed and a rough casting put in its place to be fed under the roughing cutters as the table continues its motion to the left.



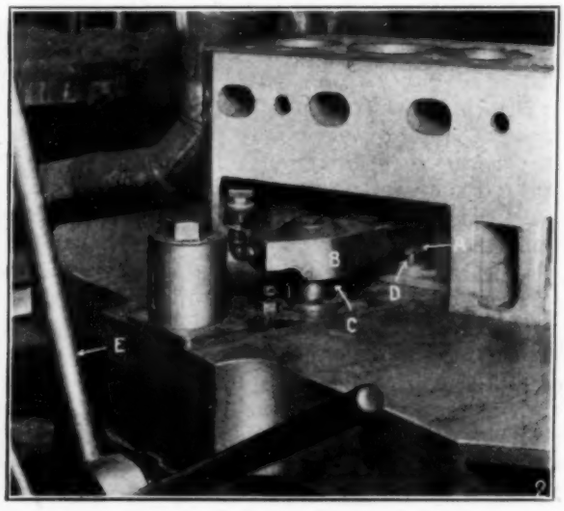


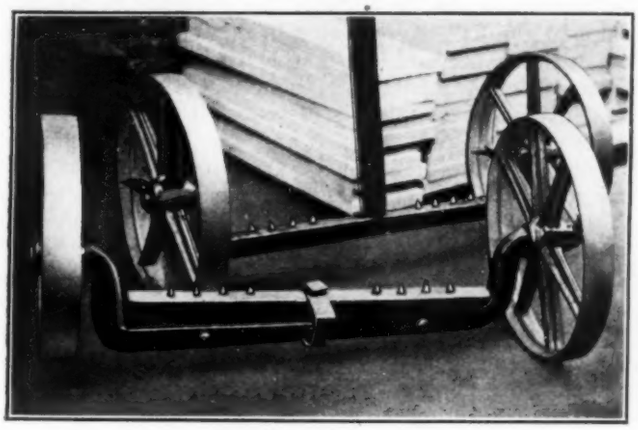
FIG. 1—CONTINUOUS MILLING OF CYLINDER BLOCKS. FIG. 2—BACK FACING BOLT HOLES

A very fussy job is the spot- or back-facing of the cylinder bolt-hole bosses as shown in Fig. 2. The bosses are hard to reach and the work requires the use of the special device to be seen in the illustration. The facing cutter *A*, is supported in the end of the arm *B* which is mounted on the column *C*. The cutter, however, is driven by the shaft *D* which comes up through the table and has a square end fitting inside a square hole in the cutter itself. The pilot wheel *E* operates the column *C* which carries the head *B* and the cutter *A*. The cutter is brought down against the boss and faces it in about the time it takes to describe the operation. The spindle *D* is then withdrawn and the cylinder block moved to the next hole.

A Handy Shop Truck

BY E. V. ALLEN

We use trucks like the one shown herewith, for all sorts of things around our shop. Lumber may be piled on the axles and the pointed spikes hold it in place. The more that is piled on the better the hold. The front axle has two heavy eyes bolted to it into which



HANDY SHOP TRUCKS

a rope is tied for pulling and guiding, though most of the movement of the load is obtained by pushing. With heavy timbers thrown on the axles the truck may be used for moving machines or almost anything within its capacity.

Using Old Pistons to Lap Cylinders

BY G. W. NUSBAUM

A great deal of information has appeared from time to time in the columns of the technical press relative to the lapping of cylinders of automotive engines with discarded pistons. The articles in question deal with the most efficient way in which to slot the piston, the proper abrasive to use, the time that can be saved and many other details.

It is strange to note how few automobile mechanics have an intelligent viewpoint of the lapping process. The theory of lapping calls for a lap that is of softer material than the part to be lapped. The lap is charged with the proper abrasive, depending upon the material to be lapped and the character of the finish desired. The harder material is then cut away by the particles of abrasive that project beyond the surface of the lap.

If a cast iron piston is used to lap cast iron cylinders it is evident that both lap and cylinder walls will become charged with abrasive to the same extent and if extreme care is not exercised there is danger of scoring the cylinders.

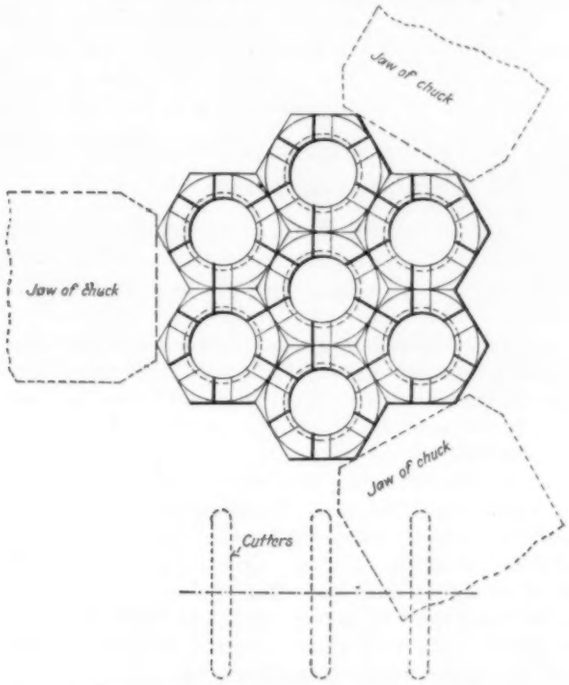
A microscopic examination of cast iron shows innumerable pockets in its surface. The abrasive must necessarily fill these pockets and no amount of washing will dislodge all of the particles. The result is that lapping continues long after the engine is assembled, thus increasing the wear on the pistons to no small degree and also unnecessarily wearing away the cylinder walls.

An Economical Method of Castellating Nuts

BY FRANCIS M. WESTON, JR.

In shops where castellated nuts are used too seldom to warrant their being carried in stock, or where a special job requires castellated nuts of a size not on hand, the method shown on the accompanying drawing saves much time and labor in making them.

Seven nuts of the same size, bunched as shown, are held in an ordinary universal three-jaw chuck on the dividing head of a milling machine. Three milling cutters of suitable type are set up on the arbor of the



GROUPING NUTS FOR CASTELLATING

machine. Three cuts clear across the work at intervals of 60 deg. completely castellate all seven nuts.

Hexagon nuts fall naturally into the grouping shown and can be held firmly in the chuck without danger of slippage or distortion. The spacing of the cutters on the arbor of the machine is found by multiplying the width across flats of one of the nuts to be castellated by the factor 0.866.

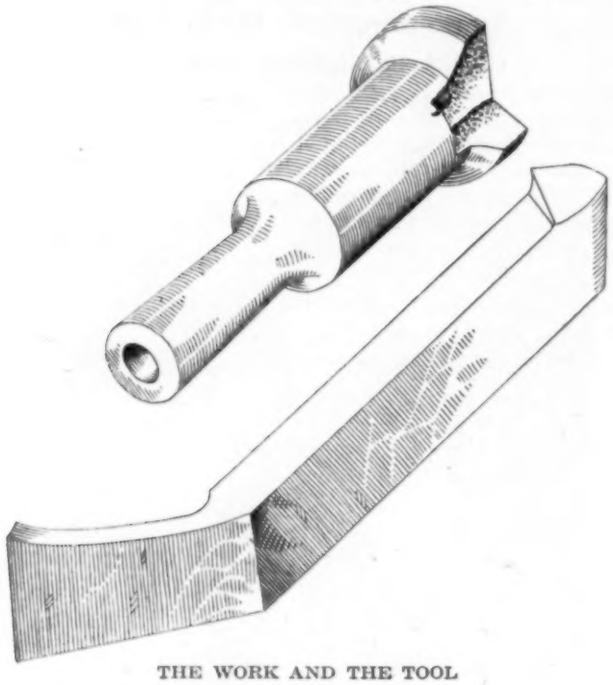
Even in small lots, this method costs less than the usual makeshift method of milling the slots in one nut at a time. In lots of a hundred or more, the cost of castellating is reduced to about one-fourth or even one-fifth of the cost of castellating singly. As no special equipment is required, this method is applicable in every shop where there is a milling machine.

Making Punches on an Engine Lathe

By Arthur C. North

I had some punches to make from 1½-in. round steel, 3½ in. long, of the shape shown in the sketch. I made them on an 18-in. engine lathe without special equipment other than the tool shown, which is a single piece of high-speed steel with a forming tool forged at one end and an offset cutting-off tool at the other.

The cutting edges were forged about ¼ in. above the stock of the shank for the purpose of making it easy



THE WORK AND THE TOOL

to grind the top rake and also to save time and material in reforging. By having both tools on one shank and both the same side up, one tool could be exchanged for the other by merely loosening the toolpost screw and swinging the shank around.

The forming tool has two angles, one to form the 45-deg. bevel under the head of the punch and the other to form the pointed pilot. When setting the tool it was necessary that the cutting edges be set at the level of the lathe center and that the 45-deg. angular face of the forming tool be set correctly to form the bevel of the head. The tool then required no further setting until the piece was ready to cut off.

The first movement was to crossfeed the tool in to form the pilot. Then withdrawing the tool the proper amount, the carriage feed would be thrown in and a roughing cut taken over the punch, leaving the latter about ⅛ in. above size. As the tool drew near the larger shoulder of the shank I would withdraw it slowly, allowing the carriage feed to continue, and thus form the fillet.

As the tool in its withdrawal reached a position to turn the diameter of the shank, the cross movement was stopped and the carriage feed continued until the tool had turned the length of the shank. There the carriage feed was stopped and the tool allowed to dwell a moment, thus smoothing up the bevel of the head. The tool was then returned to the outer end and a finish cut taken over the punch part and fillet. During this cut I would feed the tool slowly inwards so as to get the proper taper clearance. No second cut was needed on the shank.

After filing and polishing the finished piece I would swing the tool around end for end and cut the finished piece off the bar. As the end of the cut-off tool was ground with one corner in advance of the other the piece would be broken off before the tool reached the center, and the metal thus left at the center of the bar became the pilot of the next punch, only requiring a finishing cut over the end, which was the previously mentioned first movement.

I have turned 9 of these punches per hour (or 10 of the standard length) and have been able to keep up this pace all day without undue fatigue.

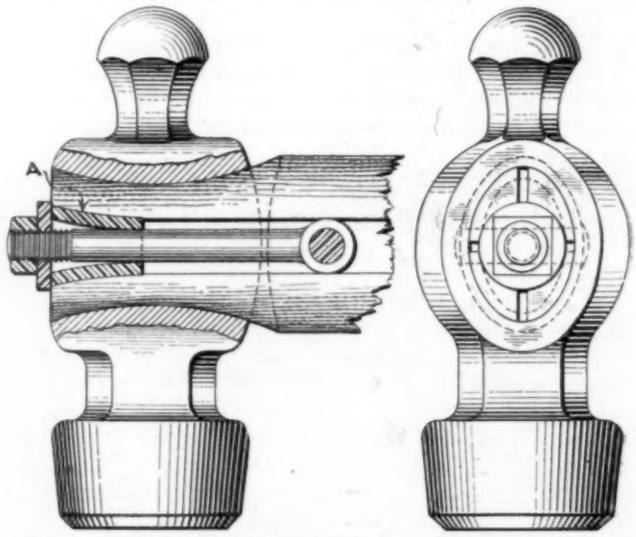
An English Fitter's Method of Fixing the Shaft of a Hammer

By J. T. Towlson
London, England

The hammer, in the hands of the old time "fitter" of the days when machine tools for doing every conceivable kind of a job were not so plentiful as now, was a tool of artistry and but few mechanics of the later days qualify to the full in its use because the opportunity for and scope of the tool have become so limited that they have but little chance and less reason to acquire the skill of their predecessors.

Many years ago, but still well within the writer's memory, the hand hammer and the "*'bout*" hammer ("*'bout*" is a contraction of the word "about") were the symbols of the fitter's calling, and proficiency in the use of these tools was the hall mark of the capable and skilful workman. As its name implied, the "'bout" hammer was one to be used in all directions—downward, upward, sidewise; with the right or the left hand to the fore; or in whatever manner the exigencies of the job demanded.

Naturally, the workman who took a proper pride in his skill at handling the hammer was also very particular about its condition. It must hang well, balance well,



ENGLISH METHOD OF SETTING A HAMMER HANDLE

strike square, and must never under any circumstances become loose on the shaft. The appended description and sketch show a method of fastening, or "fixing," much used in the writer's younger days, and he can personally vouch for instances where such hammers

have been in daily service for ten, twenty, and even thirty years, with the original shaft intact and still in excellent condition.

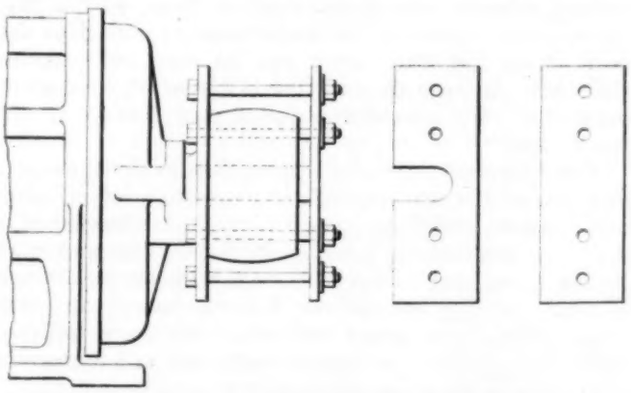
In the first place the shaft must be nicely fitted to the "eye" of the hammer. A small hole is then bored transversely through the shaft in the direction of the smaller diameter of the ellipse. A larger hole is bored axially into the shaft (from the hammer end) down to and beyond the transverse hole. A hinge-bolt is then pushed into the axial hole until the eye of the bolt is opposite to the transverse hole, when a rivet of suitable size is passed clear through both shaft and bolt and burred over at the ends to prevent it from coming out. A conical washer (*A* in the sketch) is then slipped over the end of the hinge-bolt, driven as far as practicable into the shaft, and secured with an ordinary washer and nut.

When first put in, the shaft should project somewhat beyond the hammer and the latter used for a week or so, tightening the nut from time to time as necessary, until the shaft has become firmly bedded in the eye of the hammer. The excess length can then be sawed off and the threaded end of the hinge-bolt burred over to prevent the nut from becoming loose.

Puller for Small Motor Pulleys

BY WILLIAM J. FISHER, JR.

On page 1008, Vol. 57, of the *American Machinist*, an article by Waller L. Kaufmann shows a device for pulling the pulleys of small motors when the latter are too tight to be driven off the rotor shaft with safety. I am under the impression that his device would have a tendency to break the rims if the pulleys were of cast iron,



PULLER FOR SMALL MOTOR PULLEYS

and am sending you a drawing of the device we use for the purpose, which eliminates all danger of breakage, as the stress comes upon the hub instead of the rim.

We first drill two holes through the web of the pulley and allow one pair of bolts to pass through the web. The outer clamp bears upon the end of the rotor shaft, and when the nuts are tightened a gentle tapping upon the hub with a hammer and drift will loosen the pulley. The inner clamp is cut away at the center to allow it to drop over the shaft.

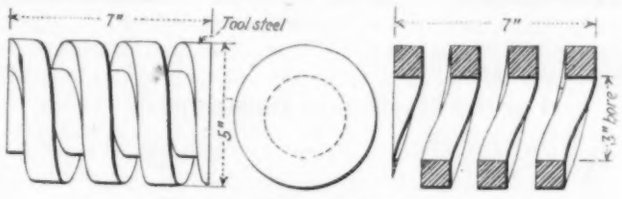
Should it not be desirable to drill the web of the pulley, the outside holes of the clamps can be used and the inner pair of bolts dispensed with. Drilling and tapping a hole at the center of the outside clamp weakens it and does not give any benefit on the draw.

Spring Winding By Hand—Discussion

BY RICHARD H. KIDDLE

Reading F. M. A'Hearn's article, under the above title on page 197, Vol. 57, of the *American Machinist*, brought to mind that some years ago the writer was called on to make a coiled spring of 1-in. square steel. The spring was to be about 7 in. long and 5 in. outside diameter.

As there was no 1-in. square steel in stock, I took a



HOW THE SPRING WAS MADE

bar of 5-in. round steel on which I cut a thread of the proper pitch and 1 in. deep, using a fairly wide tool. After completing the thread cutting the work was clamped in a V-block attached to the face plate of a lathe and bored out to 3 in. which removed the stock from the center and left the threads in the shape of a spring. The accompanying sketch shows the idea. The spring was oil tempered.

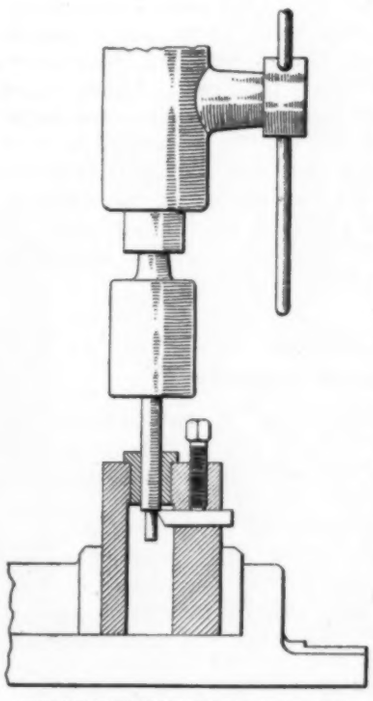
After the work was finished, one of the men remarked, "That is a regular Yankee trick."

Shouldering Rods in a Drilling Machine

BY JOSEPH E. BOIMAFI

Having 1,500 pieces of round stock, ¼ in. in diameter, to shoulder at the ends as indicated in the accompanying sketch and no screw machine handy to do it with, I made up the simple rig there shown that enabled me to get out the work very quickly and satisfactorily.

I took an old piece of cast iron from the scrap box, squared it up all over in the shaper, drilled a hole through it and bushed one end of the hole with a ¼-in. hardened steel bushing.



SHOULDERING RODS IN THE DRILLING MACHINE

Into one side of the block and at a point to coincide with the inner end of the bushing I drilled a hole for a tool bit, which I made from a piece of ¼-in. drill rod. A tapped hole for a set screw to hold and adjust the cutting tool completed the device.

With my improvised "box mill" in the vise, a quick acting chuck in the spindle of the drilling machine and a stop set on the spindle quill, nothing remained to be done but to "go to it."

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

March 15, 1923

Getting Men For the Machinery Industry

AS PREDICTED by the able economist who advises the National Machine Tool Builders' Association, a labor shortage has the machinery makers in its grip. The general public hears a lot about the shortage of unskilled labor and is up against the shortage of craftsmen in the building trades but it knows little or nothing of the problem of getting and keeping good machinists that is constantly before employers in the machinery field.

Even in dull times good machinists are none too numerous. Because of the uncertainties of the business they are apt to drift into more stable lines of work even though they may not be so happy there as in the shop. When there is a call for their services it has been the experience of many employers that at least ten per cent of them cannot be induced to return.

There will be another factor to complicate the situation if the conclusion arrived at in our leading article in this issue is correct. If machinery is to replace common labor in our industries there must be skilled or semi-skilled men to operate it and also to operate the tools which make it. A further call for men with mechanical ability seems inevitable.

The only answer for the employer seems to us to be the establishment of training and apprentice schools. Fortunately, as is brought out in the article mentioned, larger numbers of immigrants from northwestern Europe are coming to the United States at the present time than have come for some time past. If the males in those groups are not already skilled in some trade they are the type which can readily be taught in good schools. On the success of American employers in training them may depend the continuance of the wave of prosperity which is now sweeping over the country. If training in the plant is impossible support should be given to a good school in the community.

Bookings of Steel Castings 107 Per Cent of Capacity

AN EXCELLENT indication of the strength of present movement toward full industrial activity is found in a statement just sent out by the Department of Commerce. The figures quoted show that bookings of orders for steel castings of all kinds by firms comprising over two-thirds of the total capacity of the country were at the rate of 107 per cent of their normal maximum output. No such heights have even been approached since March, 1920, when the post-war boom was at its peak.

A little further analysis of the report develops other significant factors. Bookings of railway specialties were at the rate of 125 per cent of capacity. Miscellaneous castings were ordered at a rate of 94.3 per cent, which represents the largest amount booked in any month since records were first available, in January, 1920.

The rapidity of the rise in foundry activity is indicated by the fact that the rate for miscellaneous castings in July, 1922, was 57.7 per cent. No wonder steel casting prices have risen a cent and a half a pound in the last fortnight.

News of this character is the best possible for machinery men. With foundries working at capacity and falling behind in their orders it is reasonable to assume that machine shops cannot be far from capacity operation. The next step must be an increase in facilities, in other words, more machine tools to finish the castings and make them available for use.

We like to believe that tools are scrapped as they become obsolete, but experience shows that users who adopt such progressive policies are rather scarce. Those who have done so can point with pride to their balance sheets. The principal market for machinery, then, remains the one for additional equipment. It is opening up in good shape and unless some unforeseen calamity overtakes us bids fair to continue active for months to come.

Just Suppose

Just suppose somebody came to you with a proposition to furnish you with a lot of men at extremely low wages. True, he says, the men are down-and-outs, old drunks, cripples and idiots, most of them, with a few vicious ones thrown in for good measure. He does not brag about his little army and he does not promise that they can keep up with the progress of your other men. But they can be had cheap, very cheap. Would you accept?

Now, suppose you had in your shop a lot of modern and productive machinery and were in need of more and suppose somebody came to you and offered you a lot of old and decrepit junk, loose in the joints and weak in the knees and everywhere else, with no power and neither rigidity nor proper control, but cheap, very cheap, would you accept the relics and place them in your shop to slow down your production and aggravate your men to the verge of insanity?

Finally, just suppose you have some of that old worn out machinery, worked and depreciated, sinking-funded and amortized to death, or nearly so. Do you throw it out and buy new stuff, or do you point to it with pride and say: "This machinery has paid for itself; it costs me practically nothing as it stands there; it does not do much, but, just the same, it still works."

Well, what do you do?

You answer that you are not going to throw out machinery so long as it can help production, but that, of course, you would not buy it if you did not have it. And as to hiring old drunks, cripples and idiots—who ever heard of such a thing.

No, of course not, but—

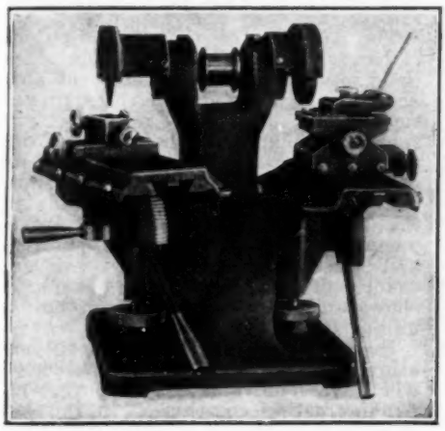
Just suppose.

Shop Equipment News

H & G Regrinder for Diehead Chasers

The Eastern Machine Screw Corporation, New Haven, Conn., manufacturers of the H & G self-opening dieheads, have just placed on the market a machine for regrinding the chasers of these dieheads.

The machine stands about 18 in. high and may be used on the bench



H & G REGRINDER FOR THREAD CHASERS

or upon a pedestal as desired. At the top is a double-end wheel spindle, mounted on ball bearings, to carry a 4x½ in. wheel at one end and a narrower wheel of the same diameter at the other.

Upon each side of the column is fitted a vertically adjustable knee, each knee surmounted by a longitudinally traversing table. Upon the table shown on the right in the accompanying illustration is a fixture to hold the four chasers of a set, face upward, so that the rake, or cutting angle, is presented to the grinding wheel. This fixture is capable of adjustment in a direction parallel to the wheel spindle, and may also be tilted for the purpose of grinding any desired degree of cutting angle. The four chasers are held simultaneously by a single cam-actuated clamp.

At the opposite side of the machine the fixture upon the table is designed to hold a single chaser so presented to the narrow grinding wheel as to grind the throat. The chaser is located in the fixture by a hardened pin that enters the cam-slot, and it rests upon an adjustable anvil by means of which the angle of presentation may be altered to increase or diminish the angularity of the throat, or entering portion of the die. The table at this end of the machine is provided with a swivelling adjustment so that by changing the angle of traverse of the table the clearance of the chaser may be made greater or less, as desired.

The tables are traversed by means of the gear segments and hand levers to be seen at the front of the machine. Other adjustments are controlled by conveniently placed knurled-head screws. Safety guards are provided for each wheel and all bearings and bearing surfaces are amply protected against dust. The machine occupies a bench space approximately 20 in. square, and the shipping weight, including a countershaft with tight and loose pulleys, is about 240 pounds.

Hergi Bench Power Screwdrivers

The Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn., is putting out a line of belt-driven bench screwdrivers for the rapid setting of screws in small assembling work. The machine is made in three sizes, to take any of the several types of

FIG. 1—HERGI VERTICAL BENCH SCREWDRIVER

Hergi screwdriver blades, and the range is such that screws from the smallest sizes up to ¼ in. may be set, and even larger sizes if the screws are not required to be extremely tight.

The vertical machine, shown in Fig. 1, can be fitted with an elevating table with fixtures to hold various kinds of work. As shown, the idlers

FIG. 2—HERGI HORIZONTAL BENCH SCREWDRIVER

are in position to lead the belt from an overhead countershaft but the stud upon which the idlers run may be changed quickly to the lower position to lead the belt from below the bench. The device is also furnished with an individual motor mounted upon the same base.

The pulley at the top of the spindle runs continuously upon independent bearings and the spindle itself is ordinarily stationary. As the work is pressed upward, the protecting sleeve recedes and allows the blade of the screwdriver to enter the slot in the head of the screw. Further pressure engages the friction in the hub of the pulley to start the spindle and drive the screw. The sleeve is held down by a spring so that at no time is the blade exposed. The screwdrivers are screwed in the lower end of the spindle and may be changed in a few seconds time.

In Fig. 2 the same mechanism is shown mounted in a horizontal position, as is more convenient for some work. Holes in the base of this stand provide for leading the belt downward in case it is desired to drive from a motor or countershaft located beneath the bench.

News Section

Standards Committee Making Headway with Symbol and Abbreviation Unification

A RECENT CONFERENCE held in New York City under the auspices of the American Engineering Standards Committee revealed a sentiment among engineers, scientists, government officials, business paper editors, and industrial executives, emphatically in favor of the unification of technical and scientific abbreviations and symbols.

It was agreed on all sides that the standardization of abbreviations and symbols would result in inestimable mental economies. The present situation with respect to the use of abbreviations and symbols in engineering, scientific, and other technical fields is comparable to a language which has degenerated into a multiplicity of dialects each of which has to be translated for the users of the others. Abbreviations and symbols constitute an ever growing and important part of the language of engineers, scientists, industrial editors, and other technical men. The use of one symbol or abbreviation for several different terms and the use of several different symbols or abbreviations for one meaning are, however, at present causing a great deal of confusion, misunderstanding, and, often, serious errors.

The conference was called upon requests from the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, and the Association of Edison Illuminating Companies, to consider abbreviations and symbols, but after some discussion of the subject it was thought desirable to include as a part of the project, the graphical symbols which are used in engineering drawings, diagrams, and the like, for representing instruments and apparatus and components of them.

It was agreed that the co-operation of foreign standardizing bodies should be sought, in the development of the work. The importance of international uniformity in symbols is great on account of the international character of much engineering and scientific work, and the importance of reference books and periodicals in foreign languages.

The work will go forward under a committee organization developed in accordance with the rules and procedure of the American Engineering Standards Committee.

Railroad Securities Reach New High Prices

Due to the favorable reports from many of the railroads made recently in the January statements and also due to the great amount of business that the railroads have in prospect, stocks on nearly all of the roads advanced in last week's trading in Wall Street. Gains of a point or more were registered in many instances. New high prices were established by the Baltimore & Ohio, New York Central and Atchison, Topeka & Santa Fe.

The Canadian Pacific, Rock Island, Northern Pacific, Southern Pacific, Southern Railway, Union Pacific, Central of New Jersey, Colorado and Southern, Delaware and Hudson, Lehigh Valley, Minneapolis, St. Paul and Sault Ste. Marie, and St. Louis-San Francisco, all showed increases in quotations.

American Smelting Report Shows Large Gain

A net income of $5,918,142 for the year 1922 is shown by the annual report of the American Smelting & Refining Co. that was recently made. As compared with the report for 1921, an increase of $4,207,201 is shown. After paying dividends upon preferred stock, there was a surplus of income placed at $2,003,112 as compared with a deficit of $2,457,102 shown by the report for 1921.

The surplus is equal to $3.28 per share on the common stock and, according to the officials of the company, most of the profits were made during the last six months of the year. The rate of earning during the last six months, if taken as a basis would have returned the share holders a dividend of $5.37 a share. By a statement made by Simon Guggenheim, president of the company, it is anticipated that 1923 will be the busiest year in the history of the concern. The estimate is based, of course, upon the present trend of activity in the field.

More Safe Makers Reported

The Department of Commerce announces that according to reports made to the Bureau of the Census, the value of products of establishments engaged primarily in the manufacture of safes and vaults amounted to $19,725,000 in 1921 as compared with $15,294,000 in 1919 and $7,257,000 in 1914, an increase of 29 per cent from 1919 to 1921, and an increase of 172 per cent for the seven-year period 1914 to 1921. This industry includes establishments manufacturing as their product of chief value fire and burglar proof safes for banks, offices, and residences; vaults, chests, and safe-deposit boxes; vault doors and linings; and steel burial vaults.

Of the 34 establishments reporting products valued at $5,000 and over in 1921, 19 were located in Ohio; 3 each in New York and Pennsylvania; 2 each in California, Illinois, and Missouri; and 1 each in Indiana, Kentucky, and Maryland.

Railroad Earnings Nearing I. C. C. Allowance

Railroad earnings during January nearly reached the mark which has been set by the Interstate Commerce Commission as a fair return on the tentative investment, according to the compilations that have been made public by the Commission recently. During the first month of the year the railroads reported a total net operating income of $60,654,700 which is 5.54 per cent on the investment while the Commission has set a net earning of $65,688,888 or 5.7 per cent as a fair return.

The business of the month on all railroads is the most favorable since their return from the government and, according to railroad authorities, proves conclusively that the railroads are capable of managing their own affairs and that less legislation is needed to guide them. New high records were set by nearly all of the railroads in the North, Middle West and Intermountain West, despite heavy storms and seasonal delays which were encountered. The figures for the month shows an increase in loading of half a million cars.

During January 1922 the net operating income was only $29,486,000 which was equivalent to 2.75 per cent. An interesting comparison in railroad operations is shown by the report that out of every dollar received by the roads this January, 81.4 cents went toward operating expenses, whereas a year ago 85.3 cents out of every dollar was used for expenses incident to operation of the properties.

More money has also been spent by railroads in January 1925 for equipment and maintenance than during the same period last year.

Steel Output Shows Gain

The production of steel ingots for the month of February amounted to 2,919,017 gross tons which is a large increase over the same month in 1922, according to the report from the American Iron & Steel Institute based upon a survey of companies making 87½ per cent of the steel in this country. Due to the fact that there were three less working days in February than in January, the rate of production as compared with January is about the same, but the total for the month shows a decrease of 332,680 tons.

Agricultural Fair in Moscow

Some interest is being shown by American manufacturers of agricultural machinery in the forthcoming All-Russian Agricultural Exposition to be held at Moscow Aug. 15 to Oct. 15. In addition to the local exhibits there will be about half of the space devoted to foreign machines and there will also be an international tractor show.

Tenth National Convention of S. I. E. to Be Important Event

The Society of Industrial Engineers will hold its Tenth National Convention at Cincinnati, April 18, 19, and 20; the major subject is "Effective Management for the Moderate-Sized Plant." Sessions will be held at the Hotel Gibson and all meetings are open to the public.

The morning of each day is devoted to plant inspection trips, while papers, addresses and discussions are reserved for afternoons and evenings. The principal speaker on Wednesday afternoon will be C. U. Carpenter, Dayton, Ohio, who will deliver an address on "Scientific Administration—The Determination of a Business Policy." At 6 p.m. there will be a dinner meeting for the Education Group when Professor H. M. Gano of the University of Cincinnati will read a paper on "The Co-operative Educational Method."

On Thursday afternoon, April 19, commencing at 2:30 p.m. three sectional meetings will occur simultaneously, as follows: Production on "Production Control Systems for the Special Order Shop"; personnel on "The Interdependence of Personnel Department and Foremen"; and accountants on "A Business Barometer—The Monthly Statement."

The chief social affair is the Banquet on the evening of the second day.

Participation in Management

The addresses and subsequent discussions on Friday evening, April 20, will be of unusual interest, not only on account of the international repute of the speakers but also because the subject, "How and to What Extent Can Workers Participate in Management" is very much to the forefront at the present in industrial circles. This subject will be discussed from three aspects, the worker, the employer, and the engineer; presented respectively by John P. Frey, editor *The International Molders' Journal;* Charles R. Hook, vice-president, American Rolling Mills, Middletown, Ohio; and John Calder, consulting engineer, author of "Capital's Duty to the Wage-Earner," recently published.

On Friday afternoon instead of any formal consideration of technical import there is to be a most original innovation. Under the direction of Dr. Carey P. McCord, industrial medical specialist of Cincinnati, there will be a "Practical Demonstration of Hiring, Examining and Protecting Employees," the "demonstrations" being made on a succession of "living subjects" submitting themselves as quasi-applicants for jobs. The procedure and method of recording the physical condition and aptitude for various employment will be displayed in detail, and the series of examinations will be so diversified as constructively to cover every human variation of fitness or disability. It will be practically shown how by organizing Community Groups the moderate-sized plant can adapt its facilities to the six departments involved—personnel, medical, education, first aid, visiting nurses, and safety—to obtain service equal with that of the large plant.

Copies of the official program may be obtained by applying to the Headquarters of The Society of Industrial Engineers, 237 South LaSalle Street, Chicago, Ill.

Recommendations of A.E.S.C. Committee on Preferred Numbers

THE SPECIAL COMMITTEE designated by the secretary of the American Engineering Standards Committee, for the formulation of some definite plan for handling the subject of Preferred Numbers, met Mar. 8, 1923. Those present were Messrs. Burnett, Condit, Hecker, LePage, Maxwell, Jenks. Two members were absent.

The Committee unanimously recommended:

1. That the scope of the problem at present consists of: (a) a study of the principles underlying dimensional standardization; (b) the application of the system of preferred numbers to the development of dimensional standards; and (c) the development of a recommended system of preferred numbers.

2. That the work should be international in scope.

3. That the work should be carried on by a special committee of the American Engineering Standards Committee, which represents national engineering societies, industrial organizations and interested government bureaus and educational institutions.

4. That the work of this special committee be given full publicity from time to time, and when the committee has framed tentative recommendations that they be presented to an informal conference of interested bodies, called by the A.E.S.C.

5. That the American Engineering Standards Committee proceed at once with the organization of a special committee in accordance with the foregoing recommendations.

Harley Company is Again Reported Sold

The Arcade Malleable Iron Co., Worcester, Mass., has practically completed negotiations for the purchase of the foundry department of the Harley Co., Springfield, which it purposes to operate in addition to its Worcester plant. It is understood the facilities of the Springfield foundry will be increased by the erection of a number of small buildings in the near future. Purchase is made from Hendee Manufacturing Co. that sold the entire plant to a syndicate headed by A. W. Morris last year, and since bought it back at a foreclosure sale. The Hendee concern retains the rest of the Harley property.

Railroad Taxes too Heavy, Says Holden

In a statement recently made by Hale Holden, president of the Chicago, Burlington & Quincy Railroad, heavy taxation of common carriers were held responsible for the present high railroad rates and the lack of improvement on some roads. Mr. Holden stated that if the taxation on railroads continued to increase at the same rate that it has in past years no reduction could be brought about and service improvements should not be looked for.

He stated that in 1922 the railroad paid a tax of $304,885,158, which was more than ten per cent increase as compared with the tax of 1921, and 94 per cent more than was paid in 1920.

Locomotive Repairing Gains In February

Due to the severe weather during the first part of February, an increase in the number of locomotives needing repairs has been reported. The total in need of repairs, reported by the Class 1 railroads of the American Railway Association, on Feb. 15 was 15,581, which was a gain of 169 as compared with the report of Feb 1. During the first fifteen days of February the railroads repaired and turned out of their shops 17,485 locomotives.

Sales of Navy and Army Surplus Property

The U. S. Navy, Central Sales Office, Navy Yard, Washington, D. C., has issued Catalog No. 182-B, announcing the sale of approximately 192,000 lb. of surplus brass, copper and bronze rivets, sealed bids to be opened at 11 a.m., March 26.

The rivets are located at the Navy Yards at Boston, Charleston, S. C., Mare Island, Calif., New York, Norfolk, Va., Philadelphia, Portsmouth, N. H., Puget Sound, Wash., and Washington, D. C.; and at the Naval Training Station, Great Lakes, Ill., Naval Operating Base, Hampton Roads, Va., Navy Supply Depot, South Brooklyn, N. Y., Naval Submarine Base, New London, Conn., Naval Torpedo Station, Newport, R. I., and Naval Air Station, Pensacola, Fla.

Terms of sale and directions for submitting bids are given in the catalog.

The War Department announces an ordnance auction to be conducted Mar. 20 at Watertown, Mass., of foundry equipment. Remelt metals; taps and dies; milling and boring cutters; boring heads; reamers; chasers and inserted saw teeth; broaches; arbors; bits, H. S. steel; drill heads; chucks, jaw and magnetic; roller and ball bearings; buckets, chip and scrap; gears of all kinds; lathe and planer tools; oil cups; punch press dies; grinding wheels; boring bars; lathe parts; bushings; collars; wrenches; bolts and nuts are among the articles to be offered.

Western Roads Report Large January Gains

By the January report of the Chicago, Burlington & Quincy, earnings for the month were increased by 150 per cent as compared with those of the same month in 1922. The operating revenue for the road was placed at $15,184,037 and the operating income is placed at $3,021,172.

Other western roads that reported, all favorably, for January were: Rock Island Lines, St. Louis-San Francisco Lines, Minneapolis, St. Paul and Sault Ste. Marie, Chicago and Alton, Kansas City Southern, International & Great Northern and the Ann Arbor Railroad.

Savings Effected Through Abandonment of Ordnance Departments

In a report of savings made by the Chief of Ordnance to the Assistant Secretary of War, it is shown that the evacuation by the Ordnance Department of 12 of its establishments, expected to be completed prior to June 30, 1923, will reduce the annual operating expenses by a minimum of $685,480.38. The evacuation has been made possible by an item of $1,642,351 included in the Second Deficiency Appropriation for 1922 for transferring war reserve stores from these establishments to strategically located depots which are more permanent in construction.

The report shows that for the twelve establishments the total operating expenses for 1922 were $685,480.38; the present return from sales of surplus property, $6,668,422.69; the estimated return from future sales, $1,743,283.71; and the value of surplus property transferred to other government departments, $12,121,383.88.

In recapitulation the report states: "The operating expenses of these twelve establishments during 1922 would have been much greater if the Ordnance Department had not at that time been contemplating their abandonment. All expenses, such as maintenance and repair, were reduced to a minimum without regard to ultimate deterioration of property, so that the above figure can be considered as a minimum only.

"You will note that there has been a cash return from sales of surplus property in connection with the disposal of these places of approximately six and one-half million dollars; that there remains an estimated future return from the sales of the real estate, etc., of one and three-quarters million dollars; and that surplus property to the total of approximately twelve million dollars has been turned over from these establishments to other Government departments; so that in the process of abandoning these establishments there has been realized in money or material approximately twenty millions of dollars."

Unemployment Decreases

The United States Bureau of Labor Statistics reports that of 43 industries in the United States 24 show increase, 18 decrease and 1 no change in number of employees during January, 1923, as compared with December, 1922.

Percentages of increase are: Automobiles, 4.2; automobile tires, 3.2; boots and shoes, 2.9; carriages and wagons, 2.2; car building and repairing, 1.9; carpets, 1.1; chemicals, 3.3; clothing, men's, 1.4; clothing, women's, 11.1; cotton manufacturing, 1.3; electrical machines, apparatus and supplies, 2; fertilizers, 10.8; foundry and machine shop, 2.3; hardware, 8; iron and steel, 1.5; leather, 1.7; lumber, millwork, 0.2; lumber, sawmills, no change; millinery and lace goods, 3.4; pottery, 36.9; shipbuilding, steel, 2.1; shirts and collars, 0.8; stamped ware, 5.8; tobacco, chewing and smoking, 3.2; woolen manufacturing, 2.

Percentages of decrease are: Agricultural implements, 2.2; baking, 1.9; brick, 7.7; cotton finishing, 0.8; flour, 7; furniture, 0.7; glass, 1.9; hosiery and knit goods, 0.2; paper boxes, 3.8; paper and pulp, 0.9; petroleum, 0.5; pianos, 0.7; printing, book and job, less than one-tenth of 1; printing, newspapers, 0.8; silk, 0.4; slaughtering and meat packing, 0.6; stoves, 4.2; tobacco, cigars and cigarettes, 4.1.

Locomotive Shipments Decline, Orders Increase

Shipments of railroad locomotives from the principal manufacturing plants declined slightly in February, according to figures published by the Department of Commerce from compilations by the Bureau of the Census. Unfilled orders, however, reached a new high record at 2,220 locomotives at the end of February, an increase of 432 during the month. Both shipments and unfilled orders on foreign account continue to decline and now form but a small proportion of the total.

The domestic shipments during Feb. 1923 were 196 against 40 for the same month last year; foreign shipments were 11 against 4. Unfilled orders are 2,141 domestic and 79 foreign against 173 domestic and 66 foreign for February of last year.

The shipments for January of this year were 217 domestic and 12 foreign; the unfilled orders were 1,699 domestic and 89 foreign.

Automotive Production Big In February

What may be considered a new record for automobile production in any one month was established during February, according to figures that have been received from the National Automobile Chamber of Commerce. During that month 270,995 cars and trucks were produced and, considering that this is the shortest month in the year, it may well be put down as a record.

Two months have exceeded this record during the history of the automotive industry, but both of them were full months, June 1922 and August 1922. In June, 289,011 cars and trucks were produced and in August 272,538 were manufactured. The number of cars to be produced during the year has been estimated at well over three million and to date the average has been well maintained.

Railroads Urge Shippers To Co-operate

According to the American Railway Association, $700,000,000 will be spent by railroads of all classes for improvements during 1923. This amount is $200,000,000 more than the yearly average for the past ten years, but it is not believed by the officials that even this amount is going to be enough to avert a car shortage after the summer shipping has been completed unless the closest kind of co-operation is exercised between shippers and carriers.

Shippers are being urged to "ship early" whenever possible and word has been sent out by many roads to see that improvement is made in the method of loading cars so that the greatest amount can be hauled per car.

Influence of War Department on Improvement of Motorized Vehicles

In the course of an address before the American Agricultural Editors Association, the Secretary of War referred to the service which his department is performing in connection with the improvement of motorized vehicles. Secretary Weeks at one point in his address said:

"One of the modern problems of the farmer, also a problem of the service of transportation in the Army, is the introduction of motorized vehicles. Both the farmer and the soldier require heavy-duty tractors which can work over open ground as well as on roads. In both cases tractors of all sizes must be developed and made efficient in operation. This is, of course, a rather specialized problem requiring the best thought of the mechanical engineer.

"The individual farmer, like the individual infantryman or artilleryman, is concerned chiefly with selection and purchase of types. The broader interests of both are, however, concerned in actual developments, and the up-to-date farmer watches the tractor manufacturer just as the artilleryman watches the Ordnance Department which administers the tractor division for the Army. These two, the Ordnance officer and the tractor manufacturer, work in close cooperation, and the Ordnance Department plays a very considerable part in stimulating the tractor industry and in guiding certain phases of development.

"Every few months there is a thorough study made of tractor requirements, in conference between the Ordnance representatives and members of the Society of Automotive Engineers. Here again we find the interests of the farm and of the Army hand in hand."

Great Northern Railway Starts Insurance Plan

A comprehensive plan of insurance protection for more than ten thousand employees of the Great Northern Railway has been inaugurated by that company. The benefits under the plan include life insurance, total or permanent disability insurance, accidental death and dismemberment insurance, weekly accident insurance and weekly sick insurance. There is no medical examination, no age limit or other causes that would bar any of the employees from participating in the policy. The Metropolitan Life Insurance Co. has issued the policies and they are to be paid for jointly by the railroad and the insured.

New Record for Car Loadings

All previous records for the third week in February were broken by car loadings as reported by the American Railway Association. During the week ending Feb. 24 there were loaded 830,223 cars on all railroads which compares with 735,286 in 1922, 659,642 in 1921 and 783,295 in 1920. All during the month of February records were established.

Government Reports on the Wire Industry

The Department of Commerce announces that reports made to the Bureau of the Census by establishments, other than rolling mills, engaged in the manufacture of wire show a considerable decrease in the volume of business done in 1921, as compared with 1919. The classified industry is confined to wire drawing establishments that are not departments of rolling mills, although the larger part of the wire output comes from plants that both roll the rods and draw the wire.

The total value of wire products reported by all classes of establishments equipped for drawing wire amounted to $251,234,800 in 1921; $392,601,100 in 1919; and $172,600,500 in 1914. The 1921 data were compiled from reports received from 107 establishments, comprising 61 independent wire drawing mills (which constitute the classified industry); 26 wire drawing departments of steel rolling mills; and 20 other concerns, including wire drawing departments of brass and copper rolling mills, manufacturers of electrical supplies, etc. Statistics are not included for establishments that purchase the wire and manufacture wire rope and cable, wire fencing, wire nails, wire cloth, and various small articles made of wire.

The decrease in the value of products of the independent wire drawing mills, from $162,151,200 in 1919 to $99,945,600 in 1921, was accompanied by a decrease in the number of persons engaged in the industry. The number of wage earners decreased 25 per cent; the wages paid, 39 per cent; and the cost of materials, 39 per cent.

Youngstown Company to Spend Ten Million Dollars

According to a recent statement of J. A. Campbell, president of the Youngstown Sheet & Tube Co., $10,000,000 will be spent for improvements during the coming year. He stated that $25,000,000 worth of equipment could be used, but that the smaller amount is all that can be allowed at this time for enlarging and improving the various plants of the company.

Much of the money will be used in improving the Steel and Tube Co. of America, located in Chicago, which will be under the control of the Youngstown Sheet & Tube Co. after April 2, unless there is an extension agreed upon. The Youngstown Sheet & Tube Co. is now the second largest independent steel company in the world, the Bethlehem Steel Co. ranking first.

New England Machine Tool Makers Busy

"The largest increases in employment in New England during January were in the metal trades, and demand at employment offices for this class of workers, especially in machinists' lines, was relatively good during the first two weeks in February" states the *Monthly Review* of the Federal Reserve Bank of Boston. "In Massachusetts the machine tool and electrical machinery manufacturers were operating on full time, while above 90 per cent of the reporting foundries and machine shops and producers of textile machinery ran full time. In the United States as a whole during January, shipments of copper from producers were at a higher rate than at any time since the peak in 1917, and stocks were again reduced; zinc shipments, considerably larger than production, caused a further shrinkage in stocks held in the country as a whole."

Many Machinery Exhibits at Swedish Fair

At the Gothenburg Exposition, Gothenburg, Sweden, which will be held May 8 to Sept. 30, many new and interesting exhibits in the machinery line will be shown in Machinery Hall. Among those exhibits that have been announced are the Vapor Accumulator, a contrivance for saving steam and fuel, the Ljungstrom engine, the Arca Regulator for regulating the pressure of electric current, gas fluids and moistures, the Birka Regulator, an automatic switch and other inventions.

Machinery Hall, where most interest is centering, is designed to express the directness, the power, and the magniture of the modern machine industry. The hall is 70 feet in height, 116 feet in width and 670 feet in length.

Electric Locomotives in Big Demand

The agreement between the Baldwin Locomotive Works and the Westinghouse Electric & Manufacturing Co. that has run for several years and by which the Baldwin Works makes electric locomotives has been extended, according to a recent report, due to the increased demand for electric locomotives. Predictions are that the demand will be further increased and it is anticipated that there will be a large foreign call for electrification of engines, due to the hydro-electric developments that are being made in many countries at the present time.

Recently the American Locomotive Co. and the General Electric Co. of Schenectady entered into a similar agreement.

Fewer Freight Cars Need Repairing

Fewer freight cars were in need of repair on Feb. 15 than at any time during the last two years, according to reports recently filed by the carriers with the Car Service Division of the American Railway Association. On that date, 206,585 or 9.1 per cent of the cars on line were in need of repair. This was a decrease since Feb. 1 of 2,886 freight cars.

On Feb. 15 last year, 352,614 or 14.5 per cent of the freight cars on line were in need of repair, while on Feb. 15, 1921, the total was 220,420 or 9.7 per cent.

Freight cars in need of heavy repair on Feb. 15 numbered 153,541. This was a decrease of 4,317 compared with the number in need of such repair on Feb. 1, while cars in need of light repair totaled 53,044 cars, an increase, however, of 1,431 during the same period.

Committee Aims to Simplify Range Boilers

Representatives of range boiler manufacturers, meeting with the Division of Simplified Practice of the Department of Commerce Feb. 28 in response to a call suggested by the Fabricated Production Department of the Chamber of Commerce of the United States, agreed upon a recommendation for sizes of such boilers to be urged as standard and upon other means of standardization and simplification. These recommendations will be considered further at a meeting of producers, dealers and consumers to be held in the summer, the recommendations meanwhile to be submitted to those concerned for study leading to acceptance.

The conference offered these recommendations:

The "short size" boiler now being used in New York City to be eliminated.

Simplification of gas heaters to be referred to such companies as Rudd, Humphries and others.

That a standard list of boiler sizes be established.

That one-half inch top and three-fourths inch side and bottom tappings of vertical boilers be eliminated.

That within one year, side spuds be eliminated and three holes be tapped in the top instead of two as at present.

That not over five one-inch openings be considered standard for horizontal boilers.

Illinois Central Plans Enlarged Shops

According to reports from Chicago, the Illinois Central Railroad expects to have the largest railroad machine shop in the world when the plans for the expansion of the Burnside car repair shops have been completed. At the present time the railroad employs 3,800 men and it is expected that after the enlargement has been made it will be necessary to hire 6,800 employees.

In the new shops all of the locomotives that are to be used by the road will be assembled and kept in perfect running order. E. H. Markham, president of the Illinois Central, expects that the yards also will be the largest in the world and that by the new improvements efficiency will be carried to its highest point. There is also some little talk in Chicago railroad circles of electrifying the Illinois Central in the city limits. The improvements are part of a scheme of expansion that the railroad started more than a year ago.

United Cast Iron Pipe Shows Substantial Gain

The United Cast Iron Pipe & Foundry Co. in its report for 1922 shows a net operating income of $1,497,865 as compared with $562,762 reported for the year 1921. After depreciation, and dividends of seven per cent on the preferred stock, the company is able to pay $1.51 per share on the common stock.

In 1921, the net income was equal to 84 cents on each share of the preferred stock. A deficit was shown in the general report of $499,159 after dividends were paid on the preferred stock.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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ABOUT FIVE weeks ago I had an interview with a distinguished European publicist then visiting the United States incognito. I asked him whether he thought the Germans would attempt to expel the French by force of arms. He answered, "No, the Germans are without arms, ammunition, money or organization. The French could destroy them utterly in the first encounter."

"But is it not possible that Germany will invite the Red Army of Russia to help her?" I inquired. "No," he replied, "the Germans are anti-boshevik to a man. They will not seek or accept Russian assistance." "How then," I persisted, "is the present deadlock to be broken?" His rejoinder was in about the following words:

"You may think my ideas fantastic, but I predict when the Poincaire government falls, as fall it must as soon as the French people realize that the occupancy of the Ruhr is costing much and producing nothing, some Napoleon of the 20th century will arise to lead the French in an attempt to subjugate and annex Germany. Then England and the United States will have to step in to preserve the world's balance of power. For," he added, "the present French Republic is a bureaucracy, not a democracy.

"By genius and temperament the French are and always have been imperialistic. Though they are still fearful of German aggression in the future they are momentarily elated with victory and in their present mood they will find it easy to plead self defense as an excuse for a pursuit of their traditional ambition."

I admit that as I listened to this prophecy it seemed fantastic, but the events that have since occurred are curiously corroborative of it. The Poincaire government is manifestly becoming unpopular.

The French troops are daily advancing farther and farther into Germany. Last week they took possession of the three big Rhine cities of Mannheim, Darmstadt and Karlsruhe, and the cables say that "the Parisian papers have simultaneously opened a lively debate about the objects of the French policy, revealing with great frankness designs which were indignantly disclaimed six weeks ago. It is now admitted that what is presently sought is a new and comprehensive treaty that will supersede the Treaty of Versailles and in one way or another secure for France what she was prevented from obtaining by American and British opposition at Paris in 1919."

Meantime it is becoming apparent that Great Britain is attempting in every way possible to cement the friendship between the two great English speaking nations of the world. Her prompt acceptance of the debt settlement that we proposed was the first step in this direction.

Ambassador Harvey's presence at "a family luncheon" given by King George at Buckingham Palace is another straw which shows the direction of the current and as the recent bye-elections in England bring Lloyd George's return to power nearer it becomes clearer and clearer that Britain's diplomacy is preparing for the time when it will become necessary for her to have the passive if not the active support of the United States in opposing the imperialistic ambitions of France.

I advert at length to conditions abroad because it is there we must look for trouble if trouble comes, and our domestic situation is so cloudless that it seems wise to be on guard against a possible change in the weather.

Particularly in the steel business the demand is so much in excess of the production that some concerns are now sending their salesman around to allay the impatience of their customers rather than to get new orders. However, there is still a healthy fear of a buyers' strike, and as yet there is no disposition to speculate or accumulate unduly large stocks.

I advert at length to conditions abroad because it is there we must look for trouble if trouble comes, and our domestic situation is so cloudless that it seems wise to be on guard against a possible change in the weather.

The business revival in progress in the United States has in fact become so accelerated that the manufacturers in some lines are tripping over each other's feet by bidding against one another for the labor they require. The result is that an advance in wages seems almost inevitable.

This is particularly the case in the steel business, where the demand is so much in excess of the production that some concerns are now sending their salesmen around to allay the impatience of their customers rather than to get new orders.

With the country's barometric industry in this predicament it is not surprising that most commodities are tending upward. To this generalization there are some exceptions, but they are chiefly among the articles that have recently advanced in value. Rubber and sugar, for instance, have reacted slightly and wool is said to be a shade easier in London and Australia, though the best informed wool merchants insist that higher prices are only a question of time and the statistical position of the article does not justify bearishness.

But these are about the only staples that are lower. Cotton has continued its upward ascent. Silk is firm and artificial silk is correspondingly higher. Copper and nearly all the metals, especially tin, are likewise strong. So are building materials, hardware, hides, leather, linen, paper and nearly everything else whose value is taken into consideration in compiling the index numbers so frequently referred to by financial writers.

The New York State Department of Labor reports a wage level for January of $26.21 a week as compared with a "peak" of $28.93 in 1920 and a prewar figure of $12.70 in June, 1914. This in part explains the activity of the retail trade which is in turn reflected by an active wholesale demand.

It is, however, to be admitted that there is still a healthy fear of a buyers' strike and as yet there is no disposition to speculate or accumulate unduly large stocks.

The outlook for the railways is growing rapidly brighter. The traffic offering is in excess of the facilities and the earnings show continued gains. Many of the roads are ordering new equipment and some executives are predicting that 1923 will be a year of exceptional prosperity for the transportation industry.

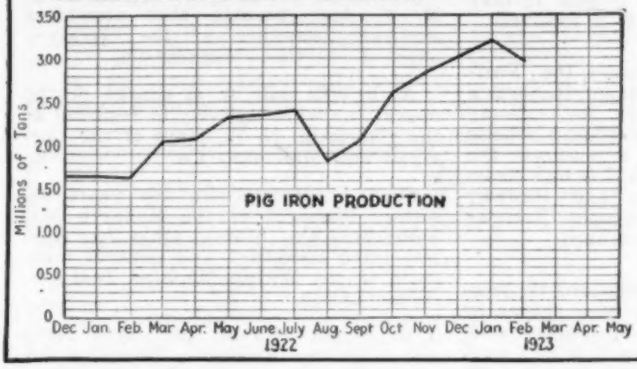
On the stock exchange the railway shares reflect this expectation but the bond market still seems to be suffering from mild indigestion while some of the industrial stocks are being over-manipulated by professional speculators who hope thereby to persuade a rather sated public to buy.

The money market, though firmer, is still well supplied with funds and the rumor that the Federal Reserve Banks would again advance the rediscount rate appears to be entirely without foundation, as the weekly statement shows a reserve ratio unchanged at 76.2 per cent and a gain of $11,000,000 in gold reserves with a reduction of $13,000,000 in bills discounted.

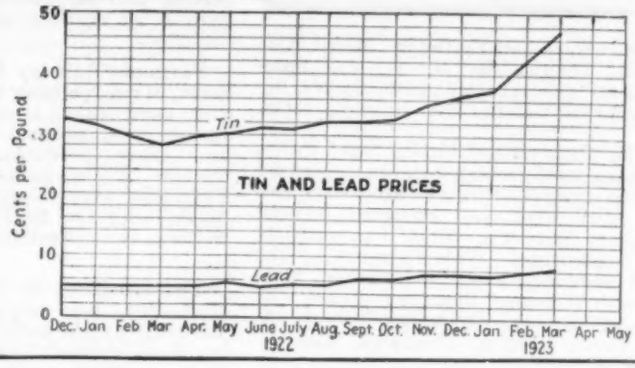
The reports from Cuba are most optimistic, reflecting the advance in sugar, and even Mexico appears to be feeling the prosperity that pervades the Western Hemisphere. If there were no Eastern Hemisphere to consider it might be assumed that the good times would last indefinitely or until the people of the New World had bought all they could pay for.

But there is an Eastern Hemisphere where three-fourths of humanity live. We are not independent of it yet and the prudent man will watch with care the history that is making there.

Monthly pig iron production of all coke and anthracite furnaces in millions of tons, based on returns compiled by the American Iron and Steel Institute.



Monthly average price of tin and lead in the New York market, based on returns furnished by Engineering and Mining Journal-Press.



PIG Iron Production, during February was greater when computed by daily averages than at any time during the past two years. The decline apparently shown by the chart is due only to the shortness of the month. The daily output during the month was 106,779 tons as compared with 104,136 tons which was the average daily output during January. Price advances are noted along with the increased production, due to the unusual demand that has been made for all kinds of iron and steel. At Pittsburgh the increase has been $3 a gross ton, while at Birmingham the new price is $26 which is a dollar increase in a week and a two-dollar increase as compared with the prices for the middle of February.

Railroads are enjoying for the first time in several months an era of prosperity that has sent most of the rail securities skyward and which has further increased faith in the management of the roads by private ownership. More equipment is being bought than ever before and car loadings are higher than they have been in the past two years, despite the weather. Net operating revenues of most roads is excellent and further increases in profits and decreases in operating costs are looked for. Shippers report better service than was formerly secured from roads.

Tin Prices, like most of the other metals have advanced rapidly during the past two months and today is quoted at 47.25 cent which is an excellent figure, according to the market authorities. It is to be noted on the chart that the point reached is nearing the fifty mark. Two months ago this was not thought probable as the product had kept well within the narrow borders of thirty and forty. Lead prices have also advanced a trifle and are now higher than they have been in many months. The unusual demands for all metals due to the industrial revivals in all parts of the country have been a determining factor in the rapid increases in the prices of tin, lead and other metals.

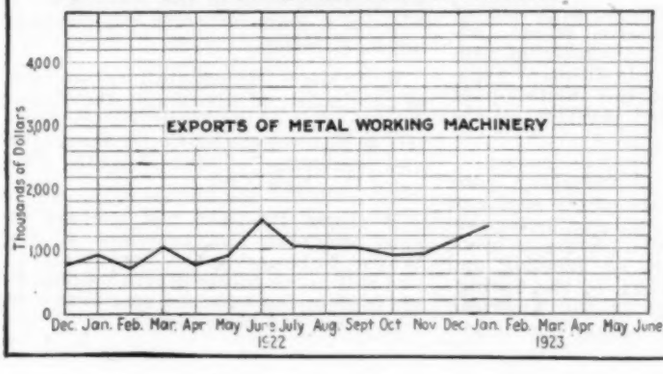
Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

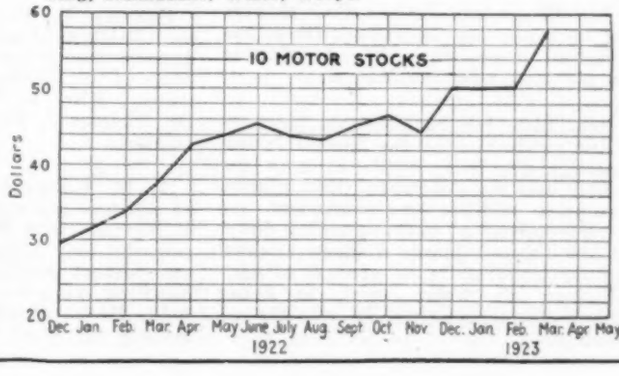
	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0322	$0.0303	$0.0272
Cold finished shafting	per lb.	0.0406	0.0383	0.0330
Brass rods	per lb.	0.1870	0.1766	0.15
Solder (½ and ½)	per lb.	0.2833	0.2538	0.20
Cotton waste	per lb.	0.1181	0.1181	0.106
Washers, cast iron (⅛ in.)	per 100 lb.	4.33	4.33	3.83
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	2.96	2.96	3.11
Lard cutting oil	per gal.	0.5575	0.575	0.57
Machine oil	per gal.	0.349	0.349	0.40
Belting, leather, medium	off list	49%	49%	46⅔%
Machine bolts up to 1 x 30 in.	off list	51⅓%	51⅓%	64⅔%

Motor stocks averaged on this page took a rise during the past month and the average during the first week in March was 57.86 which is more than seven points as compared with the figures in February. Every single one of the stocks quoted herewith increased in price during the month with the exception of Pierce that stood still and Willys that declined an eighth of a point. It is interesting to note that Stewart-Warner Speedometer advanced from 91½ to 105½, a gain of 13⅝ points within a month. Several of the others also showed substantial gains including Studebaker that issued a fine annual report recently, Stromberg that advanced from 66½ to 86 and Chandler that jumped from 65⅝ to 72⅞. It is further noted that the Stromberg Carburetor Co. has increased its stock dividend from $5 to $7 a share. The rise in prices of motor stocks is, in turn, causing the buying of them to become increasingly active, as faith is shown generally in the financial soundness of the industry and individual concerns.

Total value of all metal working machinery exported monthly from the United States, based on returns compiled by the Bureau of Foreign and Domestic Commerce.



Average price of ten automotive stocks: Chandler, General Motors, Hupp, Mack Trucks, Pierce, Stewart, Stromburg, Studebaker, White, Willys.



Business Items

The Herschell-Spillman Motor Co., North Tonawanda, N. Y., was damaged by fire recently when flames destroyed part of the heat treating room.

The plant of the Fulton Steel Corp., Fulton, N. Y., which has been operated by the Ontario Electric Steel Co., will be taken over and operated by the Iriquois Steel Co. which has recently been organized. The directors of the new company are: Alexander MacInnes, William Breeden, Frank G. Davis, S. M. Wetmore, Paul A. MacInnes, Henry Thompson and H. B. MacInnes.

The Government has awarded a contract to Mosier & Summere, Buffalo, N. Y., to build a storehouse and repair shop to cost $150,000 at the Black Rock Canal Lock.

The capital stock of the Keystone Tool & Metal Parts Corp., Buffalo, has been increased from $50,000 to $100,000.

The Buffalo, Rochester & Pittsburgh Railway has been granted permission by the Interstate Commerce Commission to issue $1,920,000 of its equipment bonds to be sold for not less than 96.75 per cent of par and accrued interest.

The Moultrie Plow & Foundry Co., Moultrie, Ga., has been established and will specialize in the manufacture of plow repair parts and other castings.

The Linde Air Products Co. has announced plans for the construction at Savannah, Ga., of a $125,000 plant. Work will be commenced in June and it is hoped to have the plant finished by December.

The F. W. Poe Manufacturing Co., Greenville, S. C., is constructing a $10,000 two story extension to its machine shops.

The Walter A. Zeinicker Supply Co., formerly of 325 Locust St., St. Louis, Mo., has moved to larger quarters in the Chamber of Commerce Building, St. Louis.

A large order for rolling mill equipment has been placed with the Westinghouse Electric & Manufacturing Co. by Siderugica Del Mediterraneo of Sagunta, Spain, through the American agents, Frank C. Robert & Co., Philadelphia.

The Cincinnati Planer Co., planers and boring mills, Cincinnati, Ohio, has advanced prices on open side planers ten per cent, effective Mar. 2.

Provisions for considerable increase in the production of the Timken roller bearings are being made at both the Canton and the Columbus, Ohio, plants. Extensive additions to equipment are being received at both factories daily. At the Canton plant, a large modern factory building is in process of construction on which work is being rushed to completion as rapidly as possible.

The Oakley Machine Tool Co., Middletown, Ohio, has found it necessary to acquire more floor space due to the large number of orders that it is receiving and at present is able to take care of all business as it is received.

Fairmont Railway Motors, Inc., Fairmont, Minn., railway section, inspection and gang cars, engines for railway motor cars, pressed steel car wheels and other products, announces the change of its corporate name from Fairmont Gas Engine and Railway Motor Car Co. to Fairmont Railway Motors, Inc., effective at once.

The Pangborn Corporation, Hagerstown, Md., will occupy nine spaces at the exhibit to be held in connection with the Foundrymen's Convention at Cleveland, April 28 to 30 and May 1 to 3. The Pangborn exhibit will be in operation and will include several types and sizes of sand-blasting equipment. The company will be represented at the exhibit by the president, vice-president, works manager, mechanical engineer, sales manager and six sales engineers.

The Link-Belt Co., of Philadelphia, Chicago and Indianapolis, announces a reduction of more than 16 per cent in the price of its portable belt conveyor, the "Cub." The new price for conveyor including motor is $585 against the former price of $700.

Personals

ARTHUR B. COCHRANE, formerly district sales manager at Chicago for the Steel and Tube Co. of America, and ROBERT HOFFSTETTER, formerly engineer with the Illinois Tool Works, and the Nash Motors Co., have formed the American Tool & Manufacturing Works, Chicago, for the purpose of designing and making special machinery, dies, jigs, screw machines and punch press products.

H. J. BRADLEY has been appointed branch manager for the San Francisco branch of the Chicago Pneumatic Tool Co., New York, succeeding J. K. HAIGH who has been transferred to the Chicago branch.

R. W. UHLIG has resigned as vice-president and factory manager of the Allen Typewriter Co., Allentown, Pa., and is now building a single shift typewriter.

SAMUEL M. VAUCLAIN, president of the Baldwin Locomotive Works, addressed the general assembly of students of the Carnegie Institute of Technology, Mar. 14, at the invitation of Dr. Thomas S. Baker, president of the Institute

J. V. EMMONS of Cleveland gave an address descriptive of the uses and abuses of twist drills, reinforcing his remarks with a motion picture to bring out correct methods of grinding and handling, at a meeting of the Springfield, Mass., chapter of the American Society for Steel Treating, March 2.

HUBER L. MORRISON will represent the Greenfield Tap and Die Corp. in Connecticut and Rhode Island.

ELDREDGE L. DAY, of Ogdensburg, N. Y., has recently been appointed assistant manager of the Syracuse office of the Case Machine Co.

A. BUBIER will be in charge of the operations when activity is resumed at the Charlotte, N. Y., plant of the Corrigan and McKinney Co.

CARL F. BERGER, for ten years assistant manager of the Monarch Machine Tool Co., Sidney, Ohio, has been appointed secretary and general manager of the Whipp Machine Tool Co., Sidney, Ohio.

B. OLNEY HOUGH, for many years editor of the *American Exporter* has resigned to become export counsellor, consultant and advisor to banks, exporters and manufacturers. His office is located at 17 Battery Place, New York.

WILLIAM V. DEE, president of the William V. Dee Co., Bridgeport, Conn., skylights and steel sashes, has announced that a branch plant may be established at Atlanta, Ga.

T. J. CLEARY has been appointed southern agent for the Combustion Engineering Corp., New York. Mr. Cleary's offices will be in the Candler Building, Atlanta, Ga.

J. C. BLANTON will have charge of the southeastern territory for Manning, Maxwell & Moore, Inc., with headquarters in the Forsyth Building, Atlanta, Ga.

WILLIAM E. DUNN, JR., Atlanta, Ga., secretary of the Southern Metal Trades Association, has just completed a tour through the southern states.

A. E. ANDERSON is the southern manager of the Maloney Belting Co., Chicago, with his offices in South Pryor St., Atlanta, Ga.

C. V. WOODWARD has been appointed manager of the Baltimore office of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

R. J. ROSS has been appointed assistant manager of the transportation division of the Philadelphia office of the Westinghouse Electric & Manufacturing Co.

F. C. REED has been appointed manager of the Huntington, W. Va., office of the Westinghouse Electric & Manufacturing Co.

W. F. JAMES has been appointed manager of the industrial division of the Philadelphia office of the Westinghouse Electric & Manufacturing Co., succeeding R. F. MOON.

R. F. MOON has resigned as manager of the industrial division of the Philadelphia office of the Westinghouse Electric & Manufacturing Co. to accept the vice-presidency of the Atlantic Elevator Co., New York.

W. BURR BENNETT has resigned as chief engineer and president of the Wayne Engineering Co., Scranton, Pa., and will in the future devote his time to his engineering business, specializing in machinery and power plants.

M. D. GALBREATH, formerly manager of sales of the McCoy-Brandt Machinery Co., has become associated with J. C. Marr of the J. C. Marr Machinery Co., which after April 1 will operate under the firm name Marr-Galbreath Machinery Co., with office and warehouse at 127-129 Water Street, Pittsburgh, Pa. The concern will deal in new and used machinery.

Obituary

F. WAYLAND AYER, for many years head of N. W. Ayer & Son, newspaper advertising agents and publishers of the *American Newspaper Annual and Directory*, Philadelphia, Pa., died on March 5 at his country home in Merideth, N. Y. Mr. Ayer was 75 years of age. He will probably be succeeded in the business by his son-in-law, W. W. Fry, who has for some time been the executive head of the concern.

GEORGE A. DRAPER, treasurer of the Draper Corporation, Hopedale, Mass., died Wednesday, Feb. 7.

FREDERICK W. LUDINGTON, aged 64 years, died recently at his home, Waterbury, Conn. Mr. Ludington was formerly the president of the Ludington Machine Co. and the L. C. White Co., both of Waterbury. Since 1918 he has been retired.

Trade Catalogs

Flexible Shaft Equipment. The Hergi Mfg. Co., 250 Fifth St., Bridgeport, Conn., has issued a new catalogue 6 x 9 in. in size, 20 pages, covering its complete line of flexible shafts and polishing, grinding, burring and screw-setting devices, including motor and belt-driven apparatus for minor operations that can be accomplished by this means.

Air Filters. Midwest Steel & Supply Co., 28 West 44th St., New York, N. Y. Air filters of all kinds are shown in the folder recently issued by this company.

Vises. Atlas Vise Co., Inc., Lowville, N. Y. Illustrated folder showing many kinds of vises and the manner in which they work has been published by this company.

Electric Arc Welding. Burke Electric Co., Erie, Pa. Bulletin 127 has been issued recently, showing various welding machines and equipment, and jobs that have been done by the machines.

Drills, Taps and Dies. Greenfield Tap and Die Corporation, Greenfield, Mass. Taps, dies and drills for lighting fixture manufacture and tables giving data on pipe threads are shown in the latest catalog of the Greenfield Tap and Die Corporation.

Band Sawing Machines. Oliver Machinery Co., Grand Rapids, Mich. The Oliver No. 192 band sawing machine is shown in the four-page folder which has recently been issued by this company.

Lifting Magnets. The Cutler-Hammer Manufacturing Co., Milwaukee, Wis. The company has issued a well illustrated eighteen-page catalog, showing the product in actual operation as well as is process of construction.

Bench Filing Machine. Hugold Anderson, Providence, R. I. A leaflet describing and illustrating the machine and its product has been issued.

Power Punching Presses. Adriance Machine Works, Inc., Brooklyn, N. Y. Various types of punching presses are shown and descriptive matter and tables given in a catalog recently issued by this company.

Belt Transmission. The Monarch Belting Co., Cleveland, Ohio. Two booklets have been issued by this company, one in the form of a "question box" and the other as a salesman's instruction book.

Ash Conveyor. Combustion Engineering Corporation, New York, N. Y. Advantages of using the product are well presented and illlustrated in a catalog that is convincingly written.

Single-Phase Motors. Wagner Electric Co., St. Louis, Mo. The product of this company with much descriptive matter and data is found in Bulletin No. 131 recently issued.

Washing Machines for Metals. Crescent Washing Machine Co., New Rochelle, N. Y. How washing machines are used in factories is explained in the catalog that this company has just issued.

Book Reviews

Modern Industrialism. By Frank L. McVey, President of the University of Kentucky. Three hundred forty-nine 5x8 in. pages, cloth boards. Second Edition. Published by D. Appleton & Co., New York City. Price $2.50.

The second edition has been deemed necessary to bring statistics up to date and to take into account the world changes that have taken place since the first edition was published. Chapters have been added on the Orient and the West, Taxation, and the Widening Circle of Democracy in Industry.

As it stands now the book is divided into three parts, History, Industry and Administration. Under "History" are given a survey of world industrial conditions, decriptions of industrial changes in England since 1760 and the industrial evolution of America, an account of the rise and fall of Germany and the chapter on the Orient and the West.

The chapters under "Industry" take up extractive industries, transportation, manufacture, forms of industrial organization, commercial institutions, and industry and taxation.

"Administration," the third part, treats of fundamental problems, interference, regulation, government ownership, and the widening circle of democracy in industry and business.

A better conception of the relations of nations each to the other and of the people within a nation to each other is needed by most individuals. They need to know what industry is, why it grew into its present size and something of its probable future. Those are just the things that this book teaches in a way that makes reading it a pleasure. It does not attempt to provide detail to an extent that would unduly involve the reader and make him lose sight of the broader aspects of the subject in its relation to world affairs.

An introduction to the scope of the work and an indication of the author's style may be gleaned from this quotation from his preface: "The world needs sound government, clarity of view and ethical purpose as much as ever. But in addition the world war raised the limits of nationality and will compel the peoples of the globe to look at and ponder the necessity of international agreements and world-wide establishment of currencies, tariff regulations, commerce rules on the high seas and the maintenance of justice in international relations between nations. Waning supplies of raw materials, the rising of the national mind in weaker peoples, the debt burden of the war and the growing consciousness of labor in the great powers of the earth all point to a different world in the coming generations and a marked change in the international relations of peoples. These make the story of modern industrialism of tremendous importance in the history of today."

Descriptive Geometry. By Lawrence E. Cutter, Associate Professor of Mechanical Engineering, Stanford University, California. First edition, brown clothboard covers, 6 x 9 in., 244 pages, 130 illustrations. Published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $2.50.

The author has a distinct purpose in bringing out this text book on descriptive geometry. He wishes to treat the subject by the method of choosing new projection planes either perpendicular or parallel to lines and planes in the problem, rather than by the method of rotation in which only two planes are used and the lines and planes of the problem are rotated either into or parallel to one of these projection planes. The latter method seems to be used almost entirely in the current texts, almost to the exclusion of the former.

The method of choosing new projection planes offers an advantage chiefly in the fact of its applicability to engineering drafting. It enables working simultaneously the short elementary problems that make up an ordinary working drawing, although these problems must usually be worked out separately when the method of rotation is employed. The former method aids in ease of work and clearness, as the views can be made to stand out separate and distinct from each other, without the overlapping and confusion of views that may occur when the planes are rotated. The author of the book believes that the method of choosing new projection planes is incomparably superior to that of rotation on account of its practical advantages and utility, and that both methods offer the same mental discipline.

The theory on which the book is based is reduced to four simple principles, covering only one page of the text. The treatment illustrates the use of the principles through the detailed solution of elementary problems, and then of problems taken from the fields of mechanical, civil and mining engineering and architecture. After covering successively points, lines, and planes, more complicated work is taken up, such as the intersection of planes and the solution of spherical triangles and trihedral angles. The latter chapters are devoted to the intersection and development of surfaces, tangent planes, axometric, isometric and oblique projection, and warped surfaces. The book ends with two chapters of exercises to be solved by the student, one chapter containing short problems for home study and the other more complex ones for the drafting room.

In the form of mimeographed notes, the text has been used successfully by the author for three years in teaching engineering students. The volume can certainly be recommended because of its practical method and the utility of the system that is developed.

Problems of Machine Design. By O. A. Leutwiler, Professor of Mechanical Engineering Design, University of Illinois. 133 6 x 9 in. pages, cloth boards. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N. Y. Price, $1.50.

A series of isolated problems covering the various parts of the subject of machine design. Practically all of the problems are taken directly from existing machines, giving the student the advantage of working with actual, rather than hypothetical engineering data.

The problems in sections I to XV deal with machine parts that have no connection with the parts discussed in other problems. Section XV includes problems in the solution of which the student makes a complete force and stress analysis of all the elements used in the machine.

Section XVI takes up the problems in the design of simple machines.

Section XVII consists of tables that will be found useful in connection with design work.

The volume should be found very advantageous by instructors in machine design who are frequently obliged to spend much time in formulating problems for classes or individual students when the text books they are using are not as complete as they might be in that respect.

Among the subjects taken up are: Stresses and strains in machine parts; riveted connections; bolts and screws; cotter and pin connections; cylinders, plates and springs; belting; rope transmission; chain transmission; friction transmission; spur gearing; bevel and screw gearing; couplings and clutches; brakes; shafting and bearings; general problems; design problems.

The Principles and Practice of Toothed Gear-Wheel Cutting. By G. W. Burley. Four hundred and fifty five 5¼x8¼ in. pages, 347 illustrations, 23 tables and one large table in pocket. Published by Scott, Greenwood & Son, 8 Broadway, Ludgate, London, England. American agents, D. Van Nostrand Co., 8 Warren St., New York.

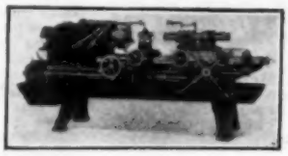
Both the theoretical and practical sides of gear cutting are treated, though no attempt has been made to deal with the subject of gearing from the viewpoint of the designer.

After a thorough discussion of the fundamental principles of toothed gearing, the book leads on to types of gear wheels,

Condensed-Clipping Index of Equipment

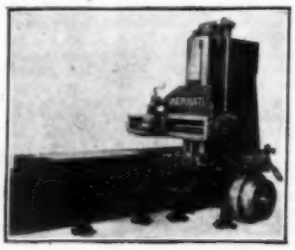
Patented Aug. 20, 1918

Lathe, Turrent, Flat, Universal, No. 2.
Acme Machine Tool Co., Cincinnati, Ohio
"American Machinist," January 4, 1923



The machine is adapted for either bar or chucking work. The all-geared head, single-pulley drive provides twelve spindle speeds of from 18 to 318 r.p.m., changed by one continuous movement of one lever. The side carriage spans the ways of the bed. Power feed is provided in either direction for both side and main turrets, and longitudinal rapid traverse in either direction for the main turret. The side head has one adjustable stop and the main turret twelve longitudinal stops. A thread-chasing attachment is in the regular equipment, and a taper turning attachment for the side head can be furnished. A 5-hp. motor may be mounted on the rear of the head-end leg. Floor space, 3 ft. 9 in. x 10 ft. 8 in. Weight, 5,000 pounds.

Planer, Open-Side, 30 x 30-Inch
Cincinnati Planer Co., Cincinnati, Ohio
"American Machinist," January 4, 1923



The table of the machine is gibbed on the right side and is so fitted between the two V's that it will not be twisted out of its ways. An auxiliary work support can be provided. The bed is closed between the V's and made very heavy on the right side. Forced lubrication delivers oil into the V's of the bed directly under the tool point. The table is of very heavy box type with the bottom entirely closed. The T-slots are planed from the solid and stop holes are drilled and reamed throughout the entire surface. Work from 6 to 10 in. longer than the rated capacity may be planed. A special "tu-speed" countershaft is furnished, and a variable-speed d.c. motor drive is recommended.

Lathe, Multi-Cut, Semi-Automatic, No. 12
R. K. LeBlond Machine Tool Co., Cincinnati, Ohio
"American Machinist," January 4, 1923

The machine is for simultaneously turning and facing such parts as gears and shafts, and is made in various bed lengths with center distances of 18, 26, 34 and 42 in. The power rapid traverse for the turning carriage and facing slide automatically stops the spindle when the feed of the tool is stopped, and the submerged rotary pump is automatically shut off. The front shear, on which the turning carriage is mounted, is placed at an angle. The rear shear, on which the facing slide operates and on which the headstock and tailstock are mounted, is in a horizontal plane. The machine can be driven by a 7½ to 15-hp. a.c. or d.c. motor. The headstock spindle has six speed changes from 50 to 250 r.p.m. Feeds of turning carriage and facing slide, 0.002 to 0.203 in. per spindle revolution.

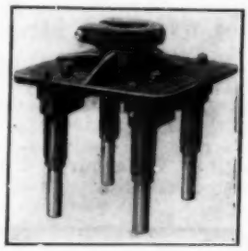
Press, Drawing and Deep-Stamping, Double-Crank, Toggle
Toledo Machine & Tool Co., Toledo, Ohio
"American Machinist," January 4, 1923

The press is made in a variety of sizes and is intended for all kinds of drawing, deep stamping and forming operations. Its chief features are the smoothness of action, the exact timing that can be obtained, the dwell on the movement of the blank-holder slide, the high speed and the small floor space. Two trains of machine-cut gearing serve to drive the machine. The large twin gears at each end of the crankshaft operate the inner slide or drawing plunger. The outer or blank-holder slide is operated by cranks. A friction clutch enables the operator to start or stop the machine at any point of the stroke. A power elevator for the plunger slide is furnished, as is also a force-feed lubricating system to oil all the main bearings from the floor.

Feeding Device, Dial, for Punch Press
S & S Machine Works, 4522 Lexington St., Chicago, Ill.
"American Machinist," January 4, 1923

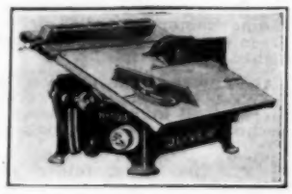
The feeding mechanism can be applied to any make and size of open-back inclinable punch press, and is useful especially in the manufacture of electrical goods. The parts being worked upon are carried under the punch to receive second or third operations. Two or three consecutive operations can be performed with only one handling. The dial feeds are built in seven sizes to suit various sizes of machines. The devices are furnished with crank disks bored to suit the press shaft, and they are arranged to bolt on the bed of the press, using the standard bolster bolts. The radial and thrust bearing in the center of the dial plate has a special mounting to provide accuracy of feed and durability. The adjustable friction brake can be set to give the minimum amount of friction needed to bring the dial to rest.

Drilling Head, Multiple-Spindle, Adjustable
Sellew Machine Tool Co., Pawtucket, R. I.
"American Machinist," January 4, 1923



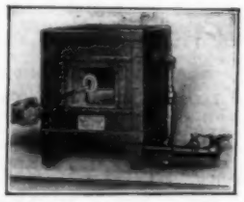
Each spindle arm of the drilling head is held in position by means of two bolts, the one about which the arm swings being permanent and the other being a removable locating and clamping bolt. The latter bolt is inserted in the hole desired to give the correct set-up, and the arm with its spindle is then locked in place. The body of the head is attached to the quill of the drilling machine, and the central driving gear is fitted on the outside of the nose of the drilling machine spindle. The head is made in several sizes, and to suit the special requirements of the work.

Saw Bench, Motor-Driven, 7-Inch, No. 193
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," January 4, 1923



The saw bench is adapted to a wide variety of work. A special base can be provided with knobs to aid in moving. The 21 x 24 in. table is grooved for the sliding cut-off gage, which may be used at either side of the saw and set to any angle. The table may be tilted up to 45 deg. The saw arbor runs on ball bearings and is driven by a ½-hp. motor. The yoke carrying the saw arbor is hinged so that the saw can be quickly raised or lowered by means of a hand lever. The driving motor, mounted on a swinging bracket, is provided with a turnbuckle mechanism for raising and lowering the motor to tighten the belt. Bench machine: height, 10 in.; weight crated, 200 lbs. With floor base: height, 32 in.; weight crated, 300 lbs.

Furnace, Gas, Heat-Treating, "Midget Universal"
Fitzgerald Forging and Heat-Treating Co.,
576 St. James Ave., Springfield, Mass.
"American Machinist," January 4, 1923



The furnace is suitable for heat-treating both high-speed and carbon tool steels. At the front of the furnace is a space 4 to 6 in. wide and 4½ in. deep where tools may be preheated to approximately 1,500 deg. F. before being placed in the heated chamber. Only 275 cu.ft. of gas are required per hour to maintain a temperature of 2,400 deg. F. Complete combustion is claimed, with the absence of scaling, pitting or wasting away of the work. The furnace is fitted with four burners. The roof of the heating chamber is arched to prevent formation of cold pockets. There is provision made at the rear of the furnace for inserting a pyrometer couple. A removable plug at the rear allows for heating long tools. Chamber: width, 6½ in.; height, 7 in.; length, 9 in.; opening, 4 x 4½ inches.

Clip, paste on 3 x 5-in. cards and file as desired

elements and rules of gearing, shop measurements of gear elements, principles of cutting gears by non-generating methods, form cutters and planing tools, generating methods of cutting gears, together with the tools used, also descriptions with illustrations of nearly all makes of machines for cutting gears.

The book is a veritable compendium on the subject and is one that can be profitably read and studied by everyone connected with gear production.

Year Book (1922) of National Association of Cost Accountants. 450, 6x9 in. pages, cloth boards. Published by the National Association of Cost Accountants, 130 West 42nd Street, New York, N. Y. Price $3.00 to non-members of the Association.

The book is devoted primarily to recounting the proceedings of the Third International Cost Conference held by the National Association of Cost Accountants at Atlantic City in September, 1922. In addition the members of the Association are listed and the names of the officers of the National Association and of the various chapters are given. The reports of the officers and directors are printed in full.

The convention papers, with the discussions that followed them, occupy the greater part of the volume. The subject matter is divided into six main parts that correspond to the six major sessions of the convention. The first is devoted to the subject of actual costs as compared with re-placement costs; the second to sales and administrative costs; the third to standards as a means of reducing costs; the fourth to budgets, their construction and use; the fifth to the place of costs in business management, and the sixth to cost problems in the textile industry. The addresses given at the banquet also are printed in full.

This report possesses a value for any firm because it treats of a subject that all firms are necessarily interested in. The membership of the society is representative of industry as a whole and the thoughts and ideas set forth in the papers read at the convention describe the latest methods and procedure in cost accounting. Not intended in any way as a text, this annual report will serve as a supplement to courses of study on cost accounting and as a guide to those engaged in practice.

Report of the Committee of the Privy Council for Scientific and Industrial Research, for the year 1921-22. Paper covers, 123 pages, 6x9¼ in. Published by his Majesty's Stationery Office, Prince St., Westminster S. W. 1, England. Price 3/2½d.

The pamphlet covers the seventh annual report of the proceedings of His Majesty's Privy Council for Scientific and Industrial Research and the Advisory Council to the Privy Council. The former deals with the reduced estimates for the year 1922-23 and its resulting effect; the opinion of the Committee on National Expenditure on the estimate; the research associations; the position of the funds held by the Imperial Trust; the number of patents granted during the term; the expenditure on grants in aid of research; and lastly the total expenditure of the Department during 1921-22.

The introduction of the report of the Advisory Council to the Privy Council gives a summary of the intended plans of the department for 1921-22 and gives a series of short notes on each of the activities, intended to show the necessity for their continuance.

In Part I of the report the present position and future prospects of the research associations are discussed. Their number and field of activities are enumerated and it is shown that they are increasing because of the government co-operation. The report further gives an account of the headquarters of the associations and relates of a conference of the combined societies in which subjects of mutual interest were discussed.

Part II of the report describes the work that has been done for national purposes. It includes the work of the co-ordinating research boards, the research undertaken in the various institutions belonging to the department and certain investigations undertaken by the Department elsewhere. A brief account is also given of the development of research for other parts of the empire, and an appendix is added which deals with the progress made in overseas dominions by recently established State and State-aided organizations for research.

The third part of the report deals with certain independent institutions and certain specific researches which have been aided by grants from the department. It also gives an account of grants made to individual research workers and students. A list of principles that should govern the policy of the state in dealing with inventions, that were formulated by the Inter-Departmental Committee on patents, is also inserted.

An appendix is supplied which gives a list of the members of the research boards and committees; statistics of grants made to individuals for research; list of aided researches; classified record of publications by individuals in receipt of grants; catalog of research associations with names of directors and secretaries; date licensed, length of work and amount of grant; and a record of departmental publications.

Machine Tools and Their Operation, Part 1. By Fred H. Colvin and Frank A. Stanley. Cloth board covers, 337 6x9 in. pages, profusely illustrated with drawings and half-tones. Contains many useful tables and charts. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N. Y. Price $4.00.

This book presents five distinct sections, dealing respectively with lathes, drilling machines, hand and automatic screw machines, boring-mills, and tools for automatic screw machine work. It is intended to teach the fundamental principles of such machining operations as come within the scope of the above-mentioned machines, as well as to cover many of the more advanced practices. Assembly drawings of the machines with all parts designated, teach the beginner the proper names, as well as help to standardize nomenclature where several names are commonly applied to similar parts.

In each chapter the book describes graphically the preparatory operations and places emphasis upon the necessity for exercising care with respect to them. The characteristics of several standard makes of automatic and hand screw machines are set forth, with directions for setting up and tooling them. Half-tones of many jobs, both usual and unusual, are given, as well as charts for camming the automatics, and tables of speeds and feeds.

The chapters on forming tools show the various methods of construction of such tools in common use and go into detail as to the manner of computing and making them. It is a book that will be of value not only to the beginner but to the old-timer who desires to keep in touch with the most advanced practice in many of our largest factories.

Design of Machine Elements. By J. A. Mease, Associate Professor of Machine Design, Lehigh University and G. F. Nordenholt, Assistant Professor of Mechanical Engineering, Lehigh University. First edition, 237 pages, 6x9 in. clothboard covers, with 101 illustrations. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $2.50.

This book is an elementary text on machine design, which deals with simple stresses and moments only. All theoretical formulas are developed and are not combined to result in short-cut formulas, in order that the student may reason out problems on the basis of fundamental relations.

The chapter headings are: Definitions and Simple Stresses; Moments and Moment of Inertia; Materials and Fundamental Considerations; Bolts, Nuts and Screw Fastenings; Determination of Required Bolt Diameters; Cylinders and Riveted Fastenings; Shafts; Transmission of Power from One Shaft to Another; Gear Tooth Profiles; Spur Gears; Bevel Gears; Worm and Worm Wheel; Belts and Pulleys; Rotating Pieces; Standard Bearings; Connecting Rods; Flywheels; Helical Springs; and Applications of Friction. There are many tables for use in application of formulas. Explanations as to how computations are made from formulas are also given, together with practical problems which are inserted at the end of each chapter. For the purpose of enhancing study, key words and phases are set in bold-face type.

The chapters in the first part of the book take up the fundamental relations between forces and stresses and then these relations are applied to simple machine elements such as bolts, nuts, screws, cylinders, shafts, gears, belts and pulleys, in succeeding chapters.

The book should be of considerable value to the student, as it gives a general insight into conditions to be met in machine design without going deeply into detail. It abounds with simple, clear definitions and examples, most of which are illustrated, and in this respect should be valuable even to the graduate engineer for refreshing the mind on the subjects covered.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Steam heating plants and accessories, water-supply and sewerage equipment, plumbing supplies, and machine tools, Manchuria. Purchase. Representative in the United States of a firm in Manchuria desires catalogs. Reference No. 5585.

Machinery for carding, spinning thread and weaving cottonized or softened henequen fiber. Mexico. Purchase. Quotations f.o.b. New York or New Orleans. Payment, cash with order. Correspondence, Spanish. Sample of the fiber was forwarded and may be examined at the bureau or its district offices. Reference No. 5596. For Sample refer to file No. 83,756.

Machinery and equipment for an arsenal. South America. Purchase. Catalogs are requested. Reference No. 5601.

Small machinery for making rope from lechuguilla fiber. Mexico. Purchase. Quotations c.i.f. El Paso, Texas. Reference No. 5606.

Contractors supplies and machinery, fruit dryers, raisin dryers, can making machinery. South Africa. Agency. Quotations, f.o.b. American port. Reference No. 5622.

Forthcoming Meetings

International Chamber of Commerce. Second general meeting, Rome, March 18 to 24. Julius Barnes, President of the United States Chamber of Commerce will head the American delegation.

National Metal Trades Association. Twenty-fifth annual convention to be held at Hotel Astor, New York City, April 18 and 19. L. W. Fischer, secretary.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Gear Manufacturers' Association. Seventh annual meeting April 19, 20 and 21, Hotel Cleveland, Cleveland, Ohio.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., May 2, 3 and 4, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society of Mechanical Engineers. Spring meeting at Montreal, Can., May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Mill prices of steel shapes at minimum of $2.35 and maximum of $2.50 per 100 lb. for early deliveries. Plate mills booked up for next three or four months due to heavy demand; quotations of $2.25, nominal, actual buying at average of $2.35, with some makers asking $2.50 per 100 lb. Bars at $2.25 for regular contract tonnages, but $2.35@$2.50 quoted on prompt shipments. Basic and No. 2 foundry iron up 50c. and bessemer $1.27 per ton at Pittsburgh. Iron and steel scrap scarcer. Rise in steel sheets at Pittsburgh mills reflected in higher warehouse quotations in Cleveland and Chicago; New York unaffected. Structurals, hoops, bands and cold finished steel up 15c. per 100 lb. in Chicago, during week. Charcoal plates rose 1½c.@2½c. and coke plates, 1c. per lb.; marking the first price advance of the current year on this material.

Rise of ¼c. per lb. in both tin and lead and 20c. per 100 lb. in zinc, in New York warehouses. Antimony up 2½c. in Cleveland; 1½c. in Chicago and 1½c. per lb. in New York, since last week. Copper firm, due to advances in foreign prices; tin rise reflects higher London market.

Declines—Roll sulphur quoted lower in New York and Cleveland warehouses.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29.05
Northern Basic	29.77
Southern Ohio No. 2	30.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.44
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	30.14
Virginia No. 2	33.17
Basic	28.50
Grey Forge	29.00
CHICAGO	
No. 2 Foundry local	30.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	31.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	28.50
Basic	28.50
Bessemer	29.27

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5½@6
Cincinnati	4@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.65@3.00	4.34	3.75	4.15
No. 12	2.75@3.10	4.39	3.80	4.20
No. 14	2.85@3.20	4.44	3.85	4.25
No. 16	3.05@3.40	4.54	3.95	4.35
Black				
Nos. 17 and 21.	3.35@3.60	4.70	4.40	4.85
Nos. 22 and 24.	3.40@3.65	4.75	4.45	4.85
Nos. 25 and 26.	3.45@3.70	4.80	4.50	4.90
No. 28	3.50@3.75	4.90	4.60	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	3.60@3.75	4.90	4.65	4.85
Nos. 12 and 14.	3.70@3.85	5.00	4.75	4.95
Nos. 17 and 21.	4.00@4.15	5.30	5.05	....
Nos. 22 and 24.	4.15@4.30	5.45	5.20	5.40
No. 26	4.30@4.45	5.60	5.45	5.55
No. 28	4.60@4.75	5.90	5.75	5 85

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel BUTT WELD Inches	Black	Galv.	Iron Inches	Black	Galv.
1 to 3	64	52½	⅜ to 1½	30	13
LAP WELD					
2	57	45½	2	23	7
2½ to 6	61	49½	2½ to 4	26	11
7 to 8	58	45½	4½ to 6	28	13
9 to 12	57	44½	7 to 12	26	11
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	62	51½	⅜ to 1½	30	14
2 to 3	63	52½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	55	44½	2	23	9
2½ to 4	59	48½	2½ to 4	29	15
4½ to 6	58	47½	4½ to 6	28	14
7 to 8	54	41½	7 to 8	21	7
9 to 12	48	35½	9 to 12	16	2

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	54%	41%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	51%	38%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 5%. Cast iron, standard sizes, 25% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.69	4.51	4.45
Cold rolled strip steel	7.00	8.25	7.25
Floor plates	5.65	5.46	5.65
Cold finished shafting or screw	4.20	3.90	4.10
Cold finished flats, squares	4.70	4.40	4.60
Structural shapes (base)	3.44	3.31	3.20
Soft steel bars (base)	3.34	3.21	3.10
Soft steel bar shapes (base)	3.34	3.21	3.10
Soft steel bands (base)	4.14	3.61	3.85
Tank plates (base)	3.44	3.31	3.20
Bar iron (2.90 at mill)	3.34	2.91	2.92½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
5/32	8.50		14.00
⅛	7.00		12.25
1/32 to ¼	6.75		11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			17.62½
Tin, 5-ton lots, New York			48.25
Lead (up to carlots), St. Louis	8.50;	New York.	9.12½
Zinc (up to carlots), St. Louis	7.90;	New York.	8.35

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	26.00	28.00
Antimony (Chinese), ton spot	10.10	11.50	9.50
Copper sheets, base	25.00	24.50@25.00	23.00
Copper wire (l.c.l.)	19.37½	21.50	16.25
Copper bars (l.c.l.)	23.25	24.75	19.50
Copper tubing (l.c.l.)	27.50	29.75	23.00
Brass sheets (l.c.l.)	21.12½	24.75	18.75
Brass tubing (l.c.l.)	25.50	29.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (carlots)	19.37½	21.75	15.75
Brass wire (carlots)	21.62½	22.00	.....
Zinc sheets (casks)	10.75	11.00	.....
Solder (½ and ½), (caselots)	33.50	30.75@32.50	20.00
Babbitt metal (83% tin)	42.00	57.25	36.00
Babbitt metal (35% tin)	25.00	18.50	.....
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	13.50@14.00	14.00	15.00
Copper, heavy, and wire	13.25@13.75	13.50	14.25
Copper, light, and bottoms	11.50@12.00	12.00	13.00
Lead, heavy	6.25@ 6.75	6.50	7.00
Lead, tea	5.75@ 6.00	5.00	6.00
Brass, heavy, yellow	8.25@ 8.75	....	9.00
Brass, heavy, red	11.00@11.50	12.00	12.00
Brass, light	7.00@ 7.50	7 50	7.75
No. 1 yellow brass turnings	8.00@ 8.50	8.50	9.00
Zinc	5 00@ 5.50	4.50	5.00

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	22.00	18.25	18.50
IX,	20x28, 112 sheets	24.50	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	19.50	16.00	17.00
IX,	20x28, 112 sheets	22.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	13.00	11.50	14.50
IC,	112 sheets	13.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.07@.12	.12	.08
Wiping cloths, 13½x13½, per lb.	.16	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	52.00 per M	.13
Sal soda, 100 lb. lots	2.60	3.50	2.65
Roll sulphur, per 100 lb	2.65	2.40	3.50
Linseed oil, per gal., 5 bbl. lots	1.01	1.08	1.12
White lead, dry or in oil	100 lb. kegs.	New York,	14.25
Red lead, dry	100 lb. kegs.	New York,	14.25
Red lead, in oil	100 lb. kegs.	New York,	15.75
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		$7.00
Coke, prompt foundry, Connellsville	per net ton		8.00

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10%	50%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅜ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	50%	40-5%	50%
Copper burs	30%	40-5%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60%	50-10%	40-10%
Second grade	65%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1 32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Calif., Los Angeles—Bushling Bros., 701 West Washington St.—garage equipment, including drill press, emery stand, hand tools, lathe, belting, hangers and pulleys.

Calif., Los Angeles—J. Malmgren, 2527 West Washington St.—machinery for garage, including drill press, lathe, emery stand and belting.

Calif., Los Angeles—Western Mchy. Exchange, Santa Fe and 9th Sts.—24, 30 and 36 in. lathes, Heald grinder, 3 ton crane, 8 and 10 in. Norton grinders, No. 1 and 2 millers, pipe machine, 20 in. shaper, radial drill and power drill press.

Calif., San Bernardino—W. D. Anderson, (mining operator)—heavy double drum hoist, turbine pump for 110 ft. head, punch and shear.

Fla., Jacksonville—City Comn., F. H. Owen, Comr. of Public Utilites, City Hall—receiving bids until Mar. 19 for machine shop equipment.

Fla., Sarasota—J. D. Hazen—machine shop and foundry equipment.

Ill., Chicago—Delta Star Electric Co., 2433 Fulton St.—Barnes drill press, four spindles, 20 or 24 in., belt or 220 volt, 3 phase, 60 cycle motor drive.

Mass., Boston—Wheeler Reflector Co., 156 Pearl St.—single action press, 6 in. stroke, to punch holes in 22 in. flat discs.

Mass., Cambridge—J. Purtell, 815 Somerville Ave.—two turret lathes (Warner & Swasey, No. 2, used preferred).

Mass., Winthrop—W. Smith, 405 Revere St.—one screw cutting engine lathe, 12 in. x 4 or 5 ft. with compound rest and chucks (used).

Mich., Detroit—Wilt Machine Co., 314 Bagley Ave.—one small punch press to take 1¼ in. shank (used).

Mo., Holden—Paschals Repair Shop, (blacksmith and machine shop)—blacksmith shop tools, anvil, drill press, emery stand, power disc and sharpener (power equipment).

Mo., Kansas City—M. Eichenberg, 1512 Locust St.—complete machine shop equipment.

N. H., Nashua—O. W. Brunell, Otterson St.—one 12 in. x 4 ft. engine lathe with compound rest and taper attachment, complete with chucks (used).

N. Y., Adams Center—W. H. Owens—lathe for motor repair shop at Henderson.

N. Y., Buffalo—D. Rizzo, 218 Court St.—automobile repair machinery, tools and equipment.

N. Y., Chaumont—Phelps Boat Co., (boat builders)—portable forge and electrically driven portable drill.

N. Y., Cortland—W. F. Maltbie Co., 145 Main St., (electrical and battery repair)—special equipment for electric battery repair and light pattern shop lathe.

N. Y., Dexter—Dexter Sulphite Pulp & Paper Co.—toolmakers lathe.

N. Y., Elmira—B. Record, 308 William St.—machinery, tools and equipment for garage on State and 2nd Sts.

N. Y., Gouverneur—W. Gauthier Co., (machine shop and garage)—machine shop and motor repair equipment, including lathe, milling machine, drill press, compressor, etc.

N. Y., Jamestown—Crescent Tool Co., Inc., 200 Harrison St., (manufacturer of wrenches)—machinery and equipment, including emery wheels, presses, etc., for 40 x 50 ft. addition to factory.

N. Y., Owego—Bd. Educ., G. M. Decker, Pres.—complete equipment, including drill press, milling machine and lathe for vocational training department of new high school.

N. Y., New York—Progressive Die Cutting Co., 204 Greene St.—shearers, 30 to 60 in.

N. Y., New York—Wachs Bros., 168½ Delancey St.—one 250 to 300 lb. drop hammer.

N. Y., Phila.—Klock Bros. Co., Main St.—complete mechanical equipment for garage and machine shop, including drill press, shaper, lathe and hand tools.

N. Y., Rochester—J. Crombie, 565 North Goodman St.—36 in. tinner's squaring shears.

N. Y., Utica—Lincoln Ave. Garage, Lincoln Ave., C. H. Elliott, Purch. Agt.—heavy rim press for truck tires, vertical post drill and high speed twist drills.

N. Y., Watertown—Farrell & Burkhard 312 Factory St. (steamfitting), T. J. Farrell, Purch. Agt.—one pipe threading and cutting machine, up to 6 in.

N. Y., Watertown—Waterman & O'Brien Co., Bway. Ave., (plumbing, tinning and heating plants), R. L. Waterman, Purch. Agt.—16 in. engine lathe and one machinists bench vise.

N. C., Wilmington—Carter's Production Wks., 210 South Front St., (machinery), O. Carter, Mgr.—small iron working lathe, about 11 in. swing; 16 in. crank shaper; floor type drill press, 20 to 24 in.; hacksaw to cut 4 x 4; wheel press 4 ft. between bars; rotary drier, about 4 x 30 ft.

O., Portsmouth—Simpson Bros., 2204 Gallia St.—complete machine shop equipment.

O., Salem—Victor Stove Co.—machinery and equipment for proposed stove factory, including machine shop and foundry equipment, to replace that which was destroyed by fire.

Okla., Tulsa—R. E. Alexander, 1512 South Main St.—bending machine for ½ x 5 in. steel plate.

Ore., Portland—H. V. Noble, Genl. Delivery—belt driven pipe cutting and threading machine, capacity up to 8 in.

Pa., Allentown—Pennsylvania Independent Oil Co., Inc.—machinery, tools and equipment, including air compressor, oil and gas pumps, etc., for large gasoline and service station on 4th and Linden Sts.

Pa., Clarks Summit—Summit Motor Co., J. Raine, Dir.—machinery and equipment for Ford and Lincoln station.

Pa., Meadville—Bronze Metal Co.—additional bronze metal working machinery and equipment.

Pa., New Castle—New Castle Metal Products Co., 716 West Brant St.—metal working machinery for proposed plant.

Pa., Youngsville—A. Miller—equipment for garage, repair shop and Chevrolet service station.

Tex., Dallas—Amer. Body Co., 2713-15 Commerce St.—single and double shaper, also 8 in. moulder.

Tex., Winnsboro—Machine Shop, Box 316—power lathe, 18 in. swing; pulleys; belts; shafting; drill press.

Va., City Point—Wilson-Hock Co., (machinery), N. Wilson, Mgr.—12,000 or 15,000 gal. fuel oil storage tank; 40 ton standard gauge locomotive; engine lathe, 16 in. swing, 12 ft. or approximately 12 ft. bed (used).

Va., Roanoke—Norfolk & Western R.R., J. H. Clemmitt, Purch. Agt.—receiving bids until Mar. 26 for a list of 42 machine tools.

Wis., Milwaukee—J. Savadil, 1503 Fond du, Lac Ave., (plumber)—one pipe cutting machine for medium heavy duty.

Ont., St. Marys—Wood Specialty Co.—power lathe.

Que., Montreal—H. G. Hope, 1027 Mount Royal Ave.—complete automobile repair equipment for Re De Normanville St. branch.

Machinery Wanted

Ala., Atmore—Hunter Lumber Co., G. R. Swift, Purch. Agt.—machinery and equipment for saw and lumber mill.

Ala., Birmingham—Amer. Laundry Co., 1720 2nd Ave., N., B. L. Wertheimer, Purch. Agt.—electric laundry machines.

Ala., York—F. I. Derby—ice and refrigeration machinery.

Calif., Covina—Nigg Bros.—machinery and equipment for 100 x 100 ft. factory for the manufacture of agricultural implements.

Calif., Wilmington—Pacific Coast Borax Co.—special conveying machinery for proposed plant.

Conn., Bridgeport—V. W. Tarnay, 69 Goddard Ave., (steel erector)—¾ ton electric hoist, a. c., equipped with chain or wire rope, lift of 35 ft.

Conn., Norwich—Falls Co., (cotton mill)—several looms and carding machines.

Fla., Bradentown—Manatee County Bd. Educ.—vocational equipment for proposed $100,000 school at Palmetto.

Ga., Chickamauga—Crystal Springs Bleachery—complete machinery for proposed bleachery.

Ill., Chicago—J. Adler, 1089 Rand-McNally Bldg. (job printer)—29 x 14 in., 4 roller, 2 revolution press; imposing table, iron surface.

Ill., Peoria—J. N. Link, 209 North Elwood St.—engravers equipment.

Ill., Rockford—Rockford Furniture Co., 23rd Ave.—woodworking machinery, including large sticker, gluer, belting and shafting.

Ia., Sioux City—Sioux City Brick & Tile Co., 9 West 3rd St.—brick and tile making machinery.

Kan., Cunningham—Clipper (newspaper)—10 x 15 in. job printing press, power equipment.

Ky., Paducah—W. Tye—complete foundry equipment.

La., Elizabeth—Calcasieu Mfg. Co.—machinery and equipment for paper mill.

Me., Brewer (Bangor, P. O.)—Bd. Educ., H. R. Houston Supt. of Schools—two small lathes, planer, saws, saw table and bandsaw for manual training department of new high school.

Me., Oakland—Bd. Educ., address Chairman—list of machinery, including lathes, planers, tables, saws, etc., for manual training department of new high school.

Md., Hagerstown—Elestano Mining Co., Inc., 3 Hamilton Row, J. K. Hoffman, Pres.—smelter equipment, including machinery for smelting tin ore and blowers.

Mass., Baldwinsville—Kenney Bros.-Walters Co., (manufacturer of furniture)—woodworking machinery, to replace that which was destroyed by fire.

Mass., Dalton—Bd. Educ., F. G. Crane, Chn.—will soon receive bids for machinery for vocational department of new high school.

Mass., Fall River—Fyans, Fraser & Blackway Co., Anawan St., (textile machinery)—Elliot & Hall or Curtis & Marble 40 and 45 in. folding machines.

Mass., Revere (Boston, P. O.)—Gentlemen & Brooks, Railroad Ave.—kindling wood cutting machine, complete with all saws (used).

Mass., Springfield—C. A. Swift, Genl. Delivery—machinery for grinding safety razor blades.

Mich., Ann Arbor—F. Mueller—Platen printing press, 8 x 10 in. or larger.

Mich., Croswell—D. E. Hubbell—Pearl 7 x 11 in. job printing press for fast work.

Minn., Bronson—Budget—one 10 x 15 in. and one 12 x 18 in. job press, power equipment.

Minn., Minneapolis—University of Minnesota, S. E. Minneapolis, H. A. Hildebrandt, Supt. of Bldgs.—woodworking machinery, including several planers and tinners' tools for new storehouse-shops building.

Minn., Stillwater—Twin City Forge & Fdry. Co., (castings, etc.), 3 to 5 ton electric hoist, 50 to 80 ft. boom guyed swing derrick, 440 volt, 60 cycle, 3 phase, a. c.

Miss., Gulfport—J. M. Harless—machinery for the manufacture of special patented mechanical eye testing machine.

N. J., Bloomsbury—Bloomsbury Graphite Co.—equipment for graphite products and foundry facings plant, to replace that which was destroyed by fire.

N. J., Trenton—Mercer County Bd. of Freeholders, A. Bray, Chn.—receiving bids until Mar. 20 for two mechanical twin hoists.

N. Y., Buffalo—C. J. Kraus, 141 Kingsley St.—equipment for automobile paint shop.

N. Y., Buffalo—G. W. Maltby & Sons, 21 Maryland St.—stone finishing machinery for factory at 2 Maryland St.

N. Y., Buffalo—J. Metke, 27 Linden Park—bottle filling machine for 4 and 12 oz. bottles.

N. Y., Buffalo—H. W Palmer, 418 Crescent Ave.—electrically operated machinery for the manufacture of automobile bodies at 217 Leroy Ave.

N. Y., Buffalo—W. H. Pollack, 95 Franklin St.—printing equipment for plant at 872 Washington St.

N. Y., Chaumont — Adams, Duford Co., (agricultural lime, stone, etc.), E. B. Johnson, Purch. Agt.—power operated hacksaw and heavy machinist's vise.

N. Y., Cold Brook—Herkimer Specialties Corp., (manufacturer of wooden articles)—heavy duty swing cutoff saw.

N. Y., East Pembroke—E. H. Miller & Son—feed and grain mill machinery and equipment.

N. Y., Elmira—L. L. Laskaris, 117 East Water St.—complete machinery and equipment for the manufacture of candy and candy products.

N. Y., Frankfort—M. H. Renken Dairy Co.—complete ammonia system equipment for milk station.

N. Y., Jamestown—H. W. Burgeson, 219 West 3rd St.—gasoline and service station equipment, including tanks and pump.

N. Y., Jamestown—Jamestown Lounge Co., 40 Winsor St.—woodworking machinery and equipment, including spring setting and upholstering equipment, for 6 story addition to plant.

N. Y., Jamestown — Jamestown Upholstery Co., Inc., 308 Crescent St., C. A. Hultquist, Secy.—woodworking machinery and upholstery equipment for 4 story addition to plant.

N. Y., Jamestown—Lake City Ice Cream Co., Richmond Pl.—ice cream making machinery and equipment to double present capacity of plant.

N. Y., Jamestown—P. C. Stapleton, West 3rd St.—complete gasoline station equipment.

N. Y., Lowville—Moore, Fenton & Dence, (lumber and millwork)—shingle making machinery and sanding machine.

N. Y., Massena—Beakes Dairy Co., C. H. C. Beakes, Mgr.—complete equipment for ammonia system and several ½ to ¾ ton hoists with travelers.

N. Y., Mayville—Bd. Educ., D. Ingerson, Clk.—vocational equipment for $160,000 school.

N. Y., Prattsburgh—W. Stilwell—5 x 8 in. printing press.

N. Y., Rochester—J. A. Charlton, 1380 Atlantic Ave.—28 or 30 in. circular saw.

N. Y., Rochester—Vogt Mfg. Corp., 408 St. Paul St., (textiles)—worsted twisting machine, 20 or 30 spindles on each side, to take spool diameter of head 3½ in. with a 6 in. traverse, ring diameter 3½ in.

N. Y., Seneca Falls—Bd. Educ.—vocational equipment.

N. Y., South Rutland—South Rutland Dairy Products Association—cheese making machinery and equipment, also one 1 ton and one 1½ ton triple chain hoist.

N. Y., Truxton—J. F. Daly, Supt.—machinery and equipment for milk receiving station at Norwich.

N. Y., Watertown—E. Burton Co., 140 Arcade St. (contractor) — oxy-acetylene steel and iron cutting outfit.

N. Y., Watertown—W. V. Denny, 345 Wise Bldg., (contractor)—circular cutoff saw with table and platform.

N. Y., Watertown—J. A. Traynor, 933 Superior St. (contractor)—motor driven air compressor and air operated rock drill.

N. C., Concord—Norcott Mills, (cotton mills)—spindles, carders, warpers and spoolers for additions to mill.

N. C., Greensboro—Guilford Lumber Co., E. J. Mendenhall, Genl. Mgr. — $75,000 worth of equipment for lumber plant, to replace that which was destroyed by fire.

N. C., Hickory—Clay Printing Co.—linotype

N. C., Hillsboro — Eno Cotton Mills, address General Superintendent—several looms for addition to mill.

N. C., Northwilkesboro—Wilkes Hosiery Co., F St.—machinery and equipment for hosiery mill.

O., Arcanum — Harris Printing Co. — 8 page newspaper press.

O., Ashtabula—F. J. Clark, 325 Prospect St.—S. H. air compressor complete with motor and tank for large gas filling station.

O., Bellefontaine—Citizens Ice & Supply Co.—ice manufacturing machinery.

O., Columbus—Mound St. Sand & Gravel Co., Furnace and Mound Sts., J. P. Hickey, Mgr.—screening and washing plant.

O., Columbus—Ohio Pump & Brass Co., Oak and 18th Sts.—machinery for proposed factory.

O., Columbus—J. C. Rairigh, 608 West Broad St.—cylinder press, automatic preferred.

O., Columbus—J. H. Zinn Lumber Co., 2556 North High St., (millwork, sash and doors) joiner, cutoff saw and small woodworking machine.

O., Girard—Bd. Educ.—vocational equipment for proposed $280,000 high school.

O., Mansfield—Barnes Mfg. Co., 701 North Main St.—equipment for proposed foundry.

O., Troy—H. Helser—pulley, paper cutter and small motor for job printing press.

O., Warren—K-W Brick Co.—brick making machinery for plant on North Mahoning Ave.

Okla., Hastings—Hastings Herald—complete newspaper equipment, including large press.

Ore., Portland—Crown Williamette Paper Co., 736 Pittock Bldg., A. J. Lewthwaite, Mgr.—machinery for proposed acid system paper mill at Oregon City.

Pa., Allentown—Allen Laundry Co., 39-41 North 10th St., W. B. MacIntosh, Proprietor — additional machinery for proposed laundry.

Pa., Allentown — Brown's White Star Laundry, 10th and Chestnut Sts., C. Brown, Proprietor — mechanical machinery and equipment for 2 story addition to plant.

Pa., Carbondale—T. J. Mulholland, c/o Mulholland Ice Cream Co.—ice cream manufacturing machinery and equipment for proposed plant.

Pa., Corry—Corry-Jamestown Mfg. Co., (manufacturer of furniture), D. A. Hillstrom, Pres.—machinery and equipment to double present capacity of plant.

Pa., Erie—Gloekler Mfg. Co., 12th St., (manufacturer of refrigerator parts)—machinery and equipment for proposed 1 story, 60 x 275 ft. factory.

Pa., Hazleton—Hazleton Iron Wks. Co., (manufacturer of machinery for mines and breakers)—iron working machinery, to replace that which was destroyed by fire.

Pa., Lebanon — South Lebanon Twp. School Bd.—complete equipment, tools and machinery for proposed $90,000 vocational school.

Pa., Newberry (Williamsport P. O.) — Winner-Franck Baking Co., West 3rd and Arch Sts., N. S. Caldwell, secy.—complete mechanical equipment for $25,000 addition to baking plant.

Pa., New Galilee—H. D. Beegle—brick making machinery and equipment.

Pa., Norristown—Montgomery Ice & Coal Co.—ice manufacturing machinery and coal handling equipment, to replace that which was destroyed by fire.

Pa., Phila.—Ballard Knitting Mills, Noble and Washington Sts., (textiles), N. D. Wright, Purch. Agt.—latch needle machines, ribbers, finishers and sewing machines for new mill at Royersford.

Pa., Phila.—T. Henry & Sons, Tioga and Collins St., (textiles), H. C. Dodd, Purch. Agt.—mule spinners, twisting spindles and accessories.

Pa., Phila. — C. H. Mostland & Sons, Amber and Collins Sts., (textiles)—broad and narrow looms with accessories, for new mill.

Pa., Phila.—O. Smith & Sons Co., Clearfield & C Sts., (manufacturer of cotton belting), C. R. Smith, Purch. Agt.—additional Garnett and pickers machines.

Pa., Phila.—H. T. White & Co., 127 South 11th St., (printers), A. Chadbourne, Purch. Agt.—perforating machine (used preferred).

Pa., Phila.—Woods & Logan, Inc., 5416 Lena St., (textiles), J. A. Kenny, Purch. Agt.—Garnett machines, sewing machines, etc.

Pa., Phoenixville—Phoenixville Publishing Co.—newspaper press and Gordon job press with Miller feeder, 10 x 15 or 9 x 12 in.

Pa., Sheffield—F. Chiodo, (road contractor)—machinery and equipment for loading and unloading plant at Russell.

Pa., Titusville — Queen City Cutlery Co., Spring and Kerr Sts., (manufacturer of pocket knives)—machinery and equipment for addition to plant.

Pa., Union City—S. F. Sturgis—machinery, equipment and tools for plant for the manufacture of jewelry at Warren.

Pa., Warren—Walker Creamery Products Co., 309 Union St.—cold storage machinery and equipment for plant at Kane.

Pa., West Chester—F. S. Bicking—machinery and equipment for paper mill at St. Joseph, Mich.

Pa., Wilkes-Barre — F. L. Schott, c/o Bartels Brewing Co., Edwardsville St.—machinery and equipment for plant for the manufacture of fireproof building materials, including ornamental brick, roofing, etc.

R. I., Providence — J. Atherton, 24 Calendar St.—several wire forming machines, various sizes. State make in quotations (used).

S. C., Olanta — Bd. Educ. — vocational equipment for $90,000 school.

S. D., Baltic—The Globe—slug casting machine.

S. D., Clark — Courier — automatic perforater and punch.

S. D., Fairfax—Advertiser—linotype.

Tenn., Chattanooga—Acme Mfg. Co., 28th St. and Ave. H, (manufacturer of cedar chests) — woodworking machinery and equipment to double present capacity of plant.

Tenn., Knoxville—Duncan Mchy. Co., 721 North Central St.—box board matcher.

Tenn., Puryear—Dixie Brick & Tile Co.—brick and tile making machinery.

Tex., Eagle Pass—Daily Guide—Eclipse folding machine.

Tex., Mesquite—Mesquite Textile Mills Co., S. B. Marshall, Pres.—machinery for proposed cotton textile plant.

Tex., Weatherford—The Printer—newspaper equipment.

Va., Norfolk—Instant Collapsible Rim Corp., Bank of Commerce Bldg.— machinery and equipment for the manufacture of metal automobile rims for $90,000 plant at Suffolk.

Va., Richmond—Leake Printing Co., 6 South 6th St.—power paper cutter.

Va., Richmond—Steel Plate Engraving Co., 616 East Main St.—plate press.

Va., Suffolk—L. G. Brothers—brick making machinery and equipment.

Wash., Centralia — Tribune — bindery equipment.

W. Va., Wellsburg—Hammond Bag & Paper Co., T. H. Hammond, Pres.—special tubers and bottomers for bag making.

Wis., Abbotsford—W. Kreuger—gasoline storage tanks and pumps for proposed filling station.

Wis., Biron (Grand Rapids, P. O.)—Consolidated Water Power & Paper Co., J. Schnabel, Purch. Agt.—one 20 ton electric crane.

Wis., Kenosha—Larson Bros. Co., 1057 Sheridan Rd., (general contractor)—belting, shafting and several small motors for proposed workshop.

Wis., Kenosha—F. M. Palmer, 662 Fremont Ave.—two cranes, not more than 5 ton.

Wis., La Crosse—J. A. Weisse, Caledonia and Gilett Sts.—woodworking and power machinery, including planers, shavers, mortisers, etc., for proposed factory.

Wis., Madison—P. J. Pierce, 321 Linden Ave.—laundry and refrigeration equipment for proposed apartment.

Wis., Manitowoc—S. W. Randolph—electric power machinery, package conveyors, hoists, etc. for proposed dock warehouse.

Wis., Milwaukee—O. A. Borchardt, 1649 9th St., (carpentry and millwork)—one combination woodworker (used preferred).

Wis., Milwaukee—J. W. Powell, 471 Van Buren St.—one paper baling machine.

Wis., Milwaukee—Quality Laundry Service, c/o G. A. Gessner, 97 Wisconsin St.—power driven laundry machinery, including washers, mangles, dryers, etc.

Wis., Milwaukee—D. Rothman, 428 4th St.—laundry machinery and belting.

Wis., Oshkosh—E. Meyer, 50 State St.—traveling crane, about 10 ton.

Wis., Oshkosh—Thompson Oil & Supply Co., 9 South Wood St.—gasoline storage tanks and pumps for proposed filling station.

Wis., Phillips—G. J. Goetsch—air compressor, gasoline storage tank and pump for proposed garage.

Wis., Port Edwards—Nekoosa-Edwards Paper Co.—electric traveling crane.

Wis., Sheboygan—The city, J. Steimle, Clk.—hoisting and unloading machinery, etc. for proposed pier.

Wis., Waukesha — Waukesha Concrete Block & Material Co., 253 South St., W. H. Hardy, Sec'y.—power tampers and moulds.

Wis., Wausau—L. A. Pradt, First Natl. Bank Bldg.—paper making machines and pulp grinders of large capacity.

Wis., Wauwatosa—Forsyth Leather Co., State St.—coal and ash handling equipment.

Wis., Wauwatosa — F. Semrow, 351 Western Ave., (carpentry and woodwork) —small planer and cross-cut saw.

B. C., Victoria—C. J. V. Spratt, Rockland St.—machinery and equipment for proposed sawmill at Port Alberni.

N. B., Bristol—A. W. Phillips—prices and catalogues, floor surfacing machinery.

Ont., Fort Erie—C. C. Morrison—complete equipment for proposed flour mill at Glencoe.

Ont., Hamilton—Stuart Bros., Hyde Park Ave., J. Stuart, Purch. Agt.—complete planing mill equipment.

Ont., Hamilton—United Gas & Fuel Co., R. A. Foley, Engr.—complete equipment for coke ovens and plant.

Ont., London — Green River Bottlers, G. House, Mgr.—complete equipment for manufacture of soft drinks.

Ont., Niagara Falls — J. B. Gallinger, Secy.—complete machinery and equipment for canning factory.

Ont., Penetanguishene—Adams Shoe Factory—machinery and equipment for plant, to replace that which was destroyed by fire. Machinery loss $25,000.

Metal Working Shops

Ala., East Thomas (Birmingham P. O.) —The St. Louis & San Francisco R. R., Frisco Bldg., St. Louis, Mo., is having plans prepared and will soon receive bids for the construction of a round house, car repair shop, store room, power house, machine shop and mill shop, here. Estimated cost $500,000. R. C. Stephens, Frisco Bldg., St. Louis, Mo., Archt.

Calif., Emeryville — The Doble Steam Motors Co., 714 Harrison St., San Francisco, awarded the contract for the construction of the first unit of its plant, 2 story, 82 x 240 ft., here. Estimated cost $90,000. The owner is also having plans prepared for complete plant to include 3 additional stories to first unit and to increase ground area to 240 x 400 ft.

Calif., Oakland — The Natl. Lead Co. of California, 485 California St., San Francisco, is having plans prepared for the construction of an addition to its plant on 47th Ave., here. Estimated cost $40,000. Private plans.

Calif., San Francisco—E. and H. Lewis, 334 6th St., are having plans prepared for the construction of a 1 story, machine shop on Folsom St. near 9th St. Estimated cost $5,000. Private plans.

Calif., Wilmington—The Pacific Coast Borax Co. is having plans prepared for the construction of a machine shop, boiler house and generating plant. A. C. Martin, Higgins Bldg., Los Angeles, Archt.

Me., Houlton—The Bangor & Aroostock R. R., Graham Bldg., Bangor, will rebuild its 1 story repair shop, which was destroyed by fire at yards, here. Estimated cost $40,000. P. R. Todd, Pres. Noted Jan. 4.

Mass., Boston—The Walworth Mfg. Co., 798 1st St., manufacturer of steam and gas fittings, tubes, etc., awarded the contract for the construction of a 1 story, 50 x 60 ft. addition to its plant. Estimated cost $25,000.

Mass., Cambridge—The Elliott Addressing Machine Co., Albany St., awarded the contract for the construction of a 4 story, 45 x 70 ft. addition to its factory. Estimated cost $50,000.

Mass., Holyoke—The Olivier Motor Co., Race St., plans to build a 3 story garage. Cost between $50,000 and $70,000.

Mass., Taunton—The Weir Stove Co., 134 West Water St., awarded the contract for the construction of a 4 story, 77 x 114 ft. addition to its factory in Wier Village. Estimated cost $40,000.

Mich., Detroit—Roehm & Davidson, 6450 Mack Ave., (wholesale hardware, steel, etc.) awarded the contract for the construction of a 153 x 154 ft. steel mill with two crane runways and depressed tracks.

Minn., Minneapolis—The Murphy Transfer Co., 309 3rd Ave., N., awarded the contract for the construction of a 4 story, 114 x 119 ft. warehouse and a 2 story 68 x 149 ft. garage on 4th St. and 9th Ave., N. Estimated cost $161,933. Noted Mar. 8.

Mo., St. Louis—The St. Louis & San Francisco R. R., Frisco Bldg., is having plans prepared and will soon receive bids for the construction of a repair shop, round house, machine shop, power house, mill shop and store room at Fyler Ave. and Frisco right-of-way. Estimated cost $500,000. R. C. Stephens, Frisco Bldg., Archt.

N. J., Bloomsbury — The Bloomsbury Graphite Co. plans to rebuild its graphite products and foundry facings plant, which was recently destroyed by fire. Estimated cost $40,000. Engineer or architect not announced.

N. J., Trenton—W. A. Weinmann, Barnes St., awarded the contract for the construction of a 75 x 100 ft. garage. Estimated cost $28,300.

N. J., Trenton—The Wills-Sainte Claire Auto Co., Prospect St., awarded the contract for the construction of a 1 story, 60 x 150 ft. garage. Estimated cost $35,000.

N. Y., Binghamton — The Larrabee-Deyo Motor Truck Corp., 23 Washington St., has purchased site and plans to build a plant to contain 50,000 sq. ft. of floor space, on Main and Emma Sts. Estimated cost $200,000. F. T. Macey, Vice Pres.

N. Y., Brooklyn—C. Fleischer, c/o Slee & Bryson, Engrs. and Archts., 154 Montague St., will build a 2 story 100 x 150 ft. garage on Newkirk Ave. Estimated cost $40,000.

N. Y., Buffalo—The New York Telephone Co., Telephone Bldg., awarded the contract for the construction of a 3 story, 150 x 200 ft. office, store room and shop building, with storage space for trucks and automobiles, on Jefferson Ave. Estimated cost $225,000.

N. Y., Long Island City—The Ditmar Ave. Development Corp., c/o Seelig & Finkelstein, Engrs. and Archts., 44 Court St., Brooklyn, will build two 1 story garages on 9th Ave., here. Estimated cost $75,000 each.

N. Y., Phila. — Klock Bros. Co. has purchased site and will build a machine shop, motor repair and service station on Main St. Cost between $10,000 and $12,000.

N. C., Charlotte—The Southern Spindle & Flyer Co., 805 West 1st St., awarded the contract for the construction of a 1 story machine shop.

O., Bridgeport — Dillon Bros. Machine Co. is having plans prepared for the construction of a 1 story, 50 x 100 ft. machine shop. Private plans.

O., Cleveland—The Royal Brass Co., 1430 East 43rd St., awarded the contract for the construction of a 1 story, 40 x 69 ft. addition to its factory. Estimated cost $15,000.

O., Cleveland—The Studebaker Corp., 2020 Euclid Ave., will soon award the contract for the construction of a 6 story, 175 x 200 ft. service building on West 131st St. W. S. Ferguson Co., 1900 Euclid Ave., Archts.

O., Cleveland—The W. S. Tyler Co., 3615 Superior Ave., (ornamental iron and bronze work), awarded the contract for the construction of a 6 story, 119 x 221 ft. factory at 3803 Superior Ave. Estimated cost $500,000. C. Zimmerman, Secy. Noted Jan. 25.

O., Columbus—The Ohio Pump & Brass Co., Oak and 18th Sts., is having plans prepared for the construction of a 1 story, 40 x 150 ft. factory on Nicholas and Livingston Aves. Estimated cost $20,000. Private plans.

O., Galion—The Galion Iron Wks. & Mfg. Co. awarded the contract for the construction of a 1 story 110 x 400 ft. machine and electrical shop.

O., Kent—The Erie R. R. Co., 50 Church St., New York City, plans to build a reclaiming rolling mill for re-rolling scrap rods, bars, etc., here. Cost between $35,000 and $40,000. Engineer or architect not announced.

O., Mansfield—The Barnes Mfg. Co., 701 North Main St., manufacturer of pumps, etc., awarded the contract for the construction of a foundry. Estimated cost $100,000. Noted Mar. 8.

O., Portsmouth—The Ohio Stove Co. awarded the contract for the construction of a 100 x 300 ft. foundry and a 40 x 40 ft. cupola building.

O., Salem—The Victor Stove Co. plans to rebuild its stove factory, which was destroyed by fire. Estimated cost $250,000. Engineer or architect not announced.

Pa., Hazleton—The Hazleton Iron Wks. Co., manufacturer of machinery for mines and breakers, plans to rebuild its iron works, which were destroyed by fire. Estimated cost $65,000. Engineer or architect not announced.

Pa., Juanita—The Pennsylvania R. R. System, Eastern Region, Broad St. Sta., Phila., is receiving bids for the construction of a 1 story, 340 x 685 ft. erecting and machine shop, here. Estimated cost $300,000. A. C. Shand, Broad St. Sta., Phila., Engr. W. H. Cookman, Broad St. Sta., Phila., Archt.

Pa., New Castle—The New Castle Metal Products Co., 716 West Brant St., plans to build a 1 story, 40 x 185 ft. metal working plant. Engineer or architect not announced.

Pa., Phila. — J. Boeckel, 516 Vine St., awarded the contract for the construction of a 4 story, 85 x 149 ft. factory for the manufacture of surgical instruments on Vine and Randolph Sts. Estimated cost $250,000.

Pa., Phila.—C. Kahn, Morris Bldg., awarded the contract for the construction of a 4 story, 37 x 160 ft. sales and service building at 1415 North Broad St. Estimated cost $200,000. E. Wilkie Motor Co., 917 North Broad St., lessee.

Pa., Pittsburgh — The Jones Motor Car Co., 10th and Muriel Sts., is having plans prepared for the construction of a 3 story, 42 x 120 ft. garage on Carson and Bingham Sts. Estimated cost $40,000. C. R. Geisler, Ferguson Bldg., Pittsburgh, Archt.

Pa., Pittsburgh—K. G. Snyder, c/o Natl. Pittsburgh Auto Co., Baum Blvd., plans to build a 4 story, 50 x 87 x 120 ft. garage on Baum Blvd. and Fairmont St. Estimated cost $100,000. Engineer or architect not selected.

Pa., Quakertown—The Krupp Fdry. Co., Inc., Lansdale, plans to build a 1 story, 125 x 200 ft. foundry for the manufacture of cast iron pipe, here. Engineer or architect not announced.

Pa., Uniontown—The Uniontown Automobile Co., c/o A. Davis, is having plans prepared for the construction of a 2 story, 41 x 50 ft. garage. Estimated cost $40,000. H. W. Altman, Fayette Title & Trust Co., Uniontown, Archt.

Pa., Warren—The Warren Garage will remodel and build an additional story to its garage on Pennsylvania Ave. Estimated cost $40,000. T. T. Moll, owner. Noted Dec. 14.

R. I., Providence—Goldberger & Steiner, Olneyville Sq., awarded the contract for the construction of a 1 story garage, service station and repair shop, on Library Court. Estimated cost $40,000. Noted Jan. 18.

Tex., Dallas—The Milam Fife Connor Investment Co., c/o Rucker & Jones, Agts., 1317 Commerce St., awarded the contract or the construction of a 4 story factory. Estimated cost $125,000. Chevrolet Motors Co., lessee.

Tex., Hemphill—The Temple Lumber Co., plans to construct mill, machine shops, power and tool houses, to replace those which were destroyed by fire. Estimated cost $500,000. Private plans.

Vt., Barre—A. B. Carter plans to build a 1 story, 75 x 195 ft. garage. Estimated cost $50,000. Engineer or architect not selected.

Wis., Madison — J. E. Teckemeyer, 807 University Ave., is having plans prepared for the construction of a 1 or 3 story, 36 x 70 ft. sales and service station. Estimated cost $40,000. E. Tough, Conklin Bldg., Madison, Archt.

Wis., Milwaukee—The Oneida Improvement Co., 214 Biddle St., plans to build a 5 story, 150 x 175 ft. garage on Front St. Estimated cost $300,000. Engineer or architect not selected.

Wis., Mount Horeb — The Hanley-Reilly Co. plans to build a 2 story, 43 x 80 ft. garage and repair shop. Estimated cost $40,000. Engineer or architect not selected.

Wis., Port Washington—The Gilson Mfg. Co., (foundry, machine shop and manufacturer of gasoline engines), plans to rebuild its 4 story factory, which was recently destroyed by fire. Estimated cost $100,000. H. W. Bolens, Pres. Engineer or architect not selected.

Wis., Racine—The Hamilton-Beach Mfg. Co., Rapids Dr., is having plans prepared for the construction of a factory unit for the manufacture of electrical equipment. F. J. Oisius, Mgr. A. L. Flegel, 530 Baker Block, Racine, Archt.

Wis., Rhinelander—The Rhinelander Paper Co. will remodel its 1 story, 70 x 220 ft. machine room. Estimated cost $40,000.

B. C., Anyox—The Granby Consolidated Mining & Smelting Co. is having plans prepared for the construction of an ore mill and concentrator. Private plans.